The

Refrigeration Service Engineer

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No. 11

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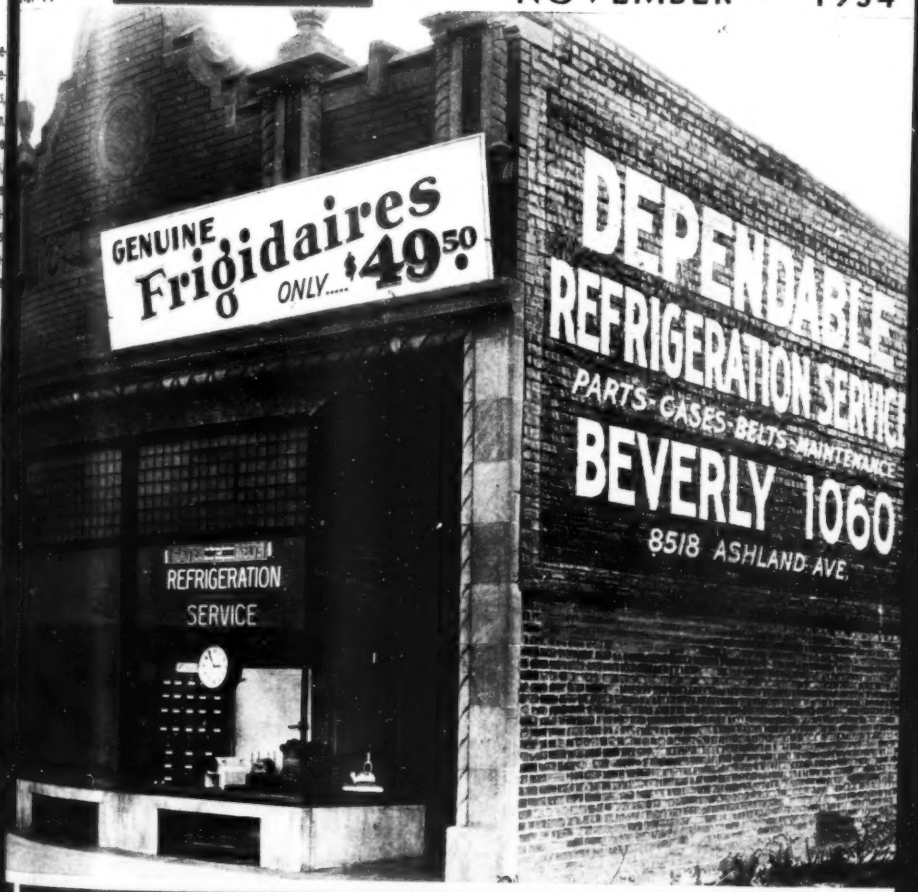

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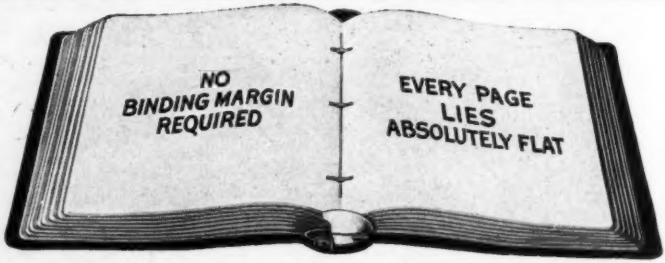

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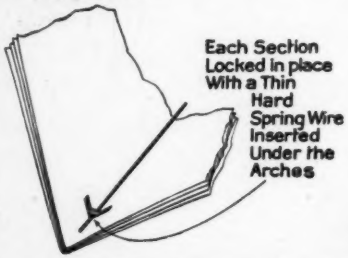

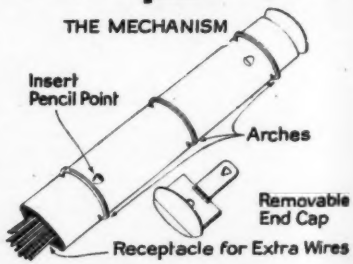

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VOL. 2 NOVEMBER, 1934 NO. 11

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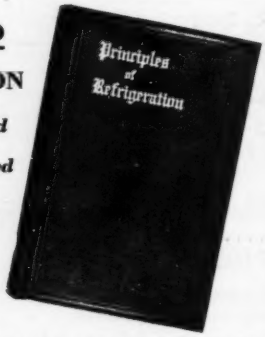

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OFFICIAL ORGAN REFRIGERATION SERVICE ENGINEERS' SOCIETY

VOL. 2, NO. 11 CHICAGO, NOVEMBER, 1934 $2.00 per Annum

First Convention of the R. S. E.

Educational Program Includes Diversified Subjects of Unusual Interest to Service Men. Delegates Attend from Many States. Plans for Future Growth of Society Made. Detroit Selected as 1935 Convention City.

THE Refrigeration Service Engineers' Society held its first annual convention in Chicago, October 11, 12 and 13. It proved to be a most profitable meeting from every viewpoint. Of particular significance is the fact that this was the first national meeting of refrigeration service men ever held. The attendance was far greater than had been expected, and the registration revealed the fact that a total of thirteen states was represented. This was most encouraging to the officers of the organization and the interest manifested in the proceedings of the meeting added still more to their satisfaction and encouragement when considering the future of the organization and the rapidly expanding industry it represents, which indeed is exceedingly bright.

The excellent educational program which had been prepared took into consideration the many phases of the servicing business and gave consideration to new types of apparatus and equipment which are now in popular use. The discussions from the floor which followed the presentation of each paper were exceedingly thorough and enlightening, representing as they did many helpful suggestions and methods that may be employed by the members of the organization in the pursuit of their work. All of this was of such an interesting nature that it was often necessary to proceed with the program so as to make it possible to complete it in the allotted time. This gives evidence of the interest that was manifested.

The convention was held in the headquarters of Chicago Chapter at 2111 West Jackson Blvd., Chicago. It was called to order by National President Herbert Herkimer, of New York, who, after a short greeting, conducted an introduction of the members which tended to make all present acquainted and likewise inform them as to the wide expanse of territory already covered by the membership. The introductions being completed, Mr. Herkimer was pleased to call on Mr. J. F. Nickerson, of Nickerson & Collins Co., Chicago, publishers of the Society's official organ, THE REFRIGERATION SERVICE ENGINEER, who made the address of welcome.

Mr. Herkimer then presented his address to the convention as next in the order of business. He told of the formation of the Society, its purposes and educational features which, as it grows in membership and expands in territory, he said, will be greatly enlarged upon, thus making it a vital factor

in the success of the profession. He anticipated the very encouraging reports of the officers of the Society, to be made during the progress of the convention and spoke with gratification of the active work of the National Educational and Examining Board which has been and which is to be a major activity of the Society. President Herkimer told with satisfaction of the Society's good fortune in having secured the service and cooperation of Mr. George H. Clark of Detroit as Educational Chairman. His address follows:

President's Address

To the Officers and Members of the Refrigeration Service Engineers' Society:

It is needless to say how gratified I am with the attendance here at our First Annual Convention and the representation from the various Chapters.

This Convention is the First National meeting of service men ever called and I am sure that this meeting will be a most important factor in the future growth and advancement of this Society.

The educational program has been designed to be of the utmost value to every service man here, and I am sure that we will all secure much from the papers to be presented by the prominent speakers who are included on this program.

Our Society is only a little over a year old, but in that time has made creditable progress. Recognizing the many advantages of coordinated effort of those men engaged in the servicing of domestic refrigerators and small commercial units, a group of service men worked out details for a national organization at a meeting called by your speaker on March 9, 1933, which formulated plans and adopted the Constitution and By-Laws for the Society. The history of the development and advancement in other industrial fields has shown that these professions and industries have been successfully guided by the work of associations or societies representing these respective fields.

The Society, as you all know, is founded along well defined lines based on the best experience of other successful organizations and I believe that it would be well to repeat in part its principal objective as provided for in its Constitution and By-Laws:

"The objects of this Society shall be to further the education and elevation of its members in the art and science of refrigeration engineering; with special reference to servicing and installation of domestic and small commercial equipment.

"The principal means toward this end shall be the holding of meetings, national, state and local, for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery, and for social intercourse.

"Each member subscribes to the belief of identity of interests of employer and employee, and this Association shall at no time be used for the furtherance of strikes or anything that will interfere with perfect harmony between them.

"Its meetings shall be devoted to the business of the Society and at all times preference shall be given to topics relating to the welfare, education and instruction of its members."

Your Society, as we shall learn from the reports of the other officers, has made advancement since its inception and the attention which it is attracting throughout the country is some indication of the further advancement which we can look forward to through the well defined program which has been adopted and which this meeting can further.

The organization has grown in the short period of its existence because of the unselfish contribution by the service men here represented and their realization that an organization of this character can contribute much to assist in the stabilization of the business and to encourage the adoption of ethical standards of practice. The Society is, of course, a non-profit organization and the officers who have worked for the advancement of this organization have devoted of their time freely without any remuneration. The Society has been particularly fortunate in having its own official organ, THE REFRIGERATION SERVICE ENGINEER, which has done a most valuable work in not only spreading the news of the Society's activities but acting as a monthly chronicle of what the organization is doing in its constituent chapters.

I know that it is gratifying to the members to learn of the active work that is now being done by the Educational and Examining Board and, of course, this work will be one of our most important activities. We have been indeed fortunate in having Mr. George H. Clark of Detroit as Chairman of the Educational and Examining Board and

we expect to hear further from him during this meeting as to the future plans of the Educational and Examining Board. There is considerable work to be done for all of the National Committees and this meeting provides an opportunity for most of our National Officers to get better acquainted and to plan a program which will be carried out for the future success of this organization.

President Herkimer closed his interesting address with the thought that there is considerable work to be done by all of the Society's committees and that the first annual convention would provide an opportunity for all of the national officers, as well as all of the members, to get better acquainted and to plan the future program to be carried out for the further success of the organization and the profession it represents.

Appointment of Committees

Next on the program President Herkimer took occasion to announce the appointment of the convention committees, as follows:

RESOLUTIONS COMMITTEE

Mr. Claude A. Brunton, Chairman, Huntington, W. Va.
Mr. Harry D. Busby, Chicago, Ill.
Mr. E. L. Hughes, Detroit, Mich.

AUDITING COMMITTEE

Mr. T. J. Fowler, Chairman, Oak Park, Ill.
Mr. G. D. Wang, Milwaukee, Wisc.
Mr. J. H. Downs, Detroit, Mich.

CREDENTIALS COMMITTEE

Mr. O. Evans, Chairman, Detroit, Mich.
Mr. John Eichhorn, St. Louis, Mo.
Mr. Ellsworth Anderson, Milwaukee, Wisc.

NOMINATING COMMITTEE

Mr. Thos. L. Carnell, Chairman, Atlanta, Ga.
Mr. Ivar Skipple, Chicago, Ill.
Mr. D. W. Walters, Eau Claire, Wisc.

Following appointment of the convention committees President Herkimer called for the report of the secretary, Harold T. McDermott, which he presented in part as follows:

Report of Secretary

To the Officers and Members of the Refrigeration Service Engineers' Society:

In presenting this report of the National Secretary's office to this convention, I am confident that this meeting is making history, and will mark an important milestone in the future success and growth of the Refrigeration Service Engineers' Society. Particularly significant is the fact that this is the first national assembly of refrigeration service men ever held. The accomplishments of this convention and the future program which may be adopted, will be watched with considerable interest by the entire servicing field.

We may consider that this organization, now only nineteen months old, has been in its formative period, but I am indeed gratified to report that substantial progress may be recorded in its brief history. As the Society grows each month, there is additional evidence of the many ways in which the service to its membership can be materially increased.

The very formation of the Society provides a vehicle for the coordination of the efforts of the men engaged in this profession to further the educational standards of its membership, to assist in the stabilization of the business, and to encourage ethical standards of practice. I feel confident that we are all of the opinion, and it is an accepted fact, that the history of industrial development in other fields has been closely paralleled with the progress of an active association, which is constantly at work in the interests of its membership and the field it serves.

As we consider these objects, we learn that the Society has been established on a well-grounded foundation, and I am happy to say that no condition has arisen, that has not been amply covered by our Constitution and By-Laws.

One of the principal activities for which the Society is formed, is the educational advancement of its members. This work is carried on through the regular meetings of its constituent chapters, and the work of its National Educational and Examining Board. I am glad to say that your Educational and Examining Board, which will present a report later in this convention, has been active in adopting its program, and already its initial release to the membership has been mailed. The second release, which hereafter will follow monthly, is now ready, and copies are available at this convention. This work has progressed under the capable supervision of Mr. George H. Clark, a member of the Detroit Chapter, as Chairman of the National Educational and Examining Board.

History

On March 23, 1933, pursuant to a call by our National President, Mr. Herbert Herkimer, a group of service men attended a meeting in New York, at which the publisher of our official organ, Mr. J. F. Nickerson, was invited to attend and assist in the promotion of the National Society. At that time, the Constitution and By-Laws were presented to the meeting, and adopted. Through the efforts of our National President, in cooperation with Mr. Nickerson,

GROUP PHOTO OF OFFICERS 1934-35, R.S.E.S.

Seated, left to right: G. D. Wang, Milwaukee, Second Vice-president; James H. Downs, Detroit, First Vice-president; Retiring President H. Herkimer; Thomas J. Fowler, Chicago, President-elect; E. J. Merenda, New York, Treasurer.

Standing, left to right: H. T. McDermott, Chicago, Secretary; Claude Brunton, Huntington, W. Va.; D. W. Walters, Eau Claire, Wisc.; Harry D. Busby, Chicago, Members of the Board of Directors, Geo. H. Clark, Detroit, Chairman Educational Board.

plans for the development of a representative organization were laid. In order to emphasize the importance of the refrigeration servicing profession, and to further the interests of the organization, Mr. Nickerson, on behalf of his publishing company, Nickerson & Collins Company, outlined the plans for publication of our official organ, which would be devoted exclusively to the interests of the refrigeration service man. This publication was started in June, 1933, and has contributed liberally in space to the activities of our Society, a special department appearing in each issue. It has played no small part in the development of constituent chapters, as well as an important medium of contact with the membership-at-large.

Formation of Chapters

New York Chapter is the oldest chapter in our Society, having adopted a resolution to form as a body on January 29, 1933, and application being made for a charter to the National Society on March 23, 1933. The formal presentation of the charter to the New York Chapter was made by the Second Vice President, Mr. Walter M. Kempf, on May 4, 1934.

On April 11, 1933, the service men of Northern New Jersey held a meeting at which Mr. J. F. Nickerson, publisher of our official organ, outlined the purposes and objects of the National Society, and Northern New Jersey Chapter made formal application for its charter to the National Society, which was formally presented to them on April 11, 1934.

On May 2, 1933, Chicago Chapter applied to the National Society for a charter, which was formally presented to them on February 23, 1934.

On July 19, 1933, at a meeting for service men in Detroit, Detroit Chapter was formed, and application made for a charter, which was formally presented to them on October 1, 1934.

St. Louis Chapter on January 25, 1934, made application for a charter, which was presented to them on June 19, 1934.

Milwaukee Chapter is the youngest member of our organization, having filed application for charter on February 27, 1934, and receiving it May 15, 1934.

It is particularly encouraging to note the interest that is shown throughout the country by many service groups who have communicated with your National Secretary's office regarding the starting of chapters in various sections of the country, and I conservatively say that through the work which has now been started, that we can reasonably feel sure of an additional twelve chapters during the coming year.

Having the opportunity of working with your National officers, and the officers of our local chapters, I would be negligent in my

duty if I did not acknowledge my appreciation for their unselfish assistance to this office, and the interest they have manifested in the advancement of your Society. As the Society is a non-profit organization, the officers have contributed their time and money with the only expectation that the work they have done is contributing to the welfare and advancement of the membership of your Society.

The secretary's report was well received, and emphasizes the timeliness and importance of the organization.

Benefits and Field for Modernization of Obsolete Apartment Equipment

The first speaker on the program to be announced by President Herkimer was Mr. George H. Clark, of Mercier & Clark, Inc., Detroit, Mich., who presented a most valuable paper entitled, "Benefits and Field for Modernization of Obsolete Apartment Equipment." He first considered the management of apartment houses, especially in the city of Detroit, and the obstacles encountered during the period including 1932 to the present time when they have been non-paying investments with the natural result that the maintenance of these buildings was not of the standard that obtains under normal renting conditions. This was incidental to his very interesting discussion of the maintenance of refrigeration equipment of which, he said, there are many good systems, while there are also numerous poor installations. Mr. Clark's paper is printed in full and appears on another page of this issue.

President Herkimer again, at this time, took occasion to introduce several more visitors who had arrived, after which he announced the next paper which dealt with the subject, "Dehydration of Refrigerator Assemblies in the Field," prepared by Mr. F. B. Riley, of Detroit. Due to Mr. Riley's unavoidable absence, the Chairman requested Mr. G. D. Wang, of Milwaukee, to read the paper, after which Mr. Wang elaborated on some of the points dealt with in the paper —one point especially, that of moisture in the system. He said he used calcium chloride as a dryer for a day or two and then, to play safe, switched over to calcium oxide. Another thing, he said, if the system contains a considerable amount of moisture, and to dry it quickly, use a calcium chloride dryer in the line, run the hot gases through and dehydrate the entire system. He said that by doing this, even on a new job, it would be found to be highly satisfactory.

In answer to a question by Mr. Alfred J. Meinke, of Madison, Wis., as to the quantity of dehydrant to use in proportion to the quantity of refrigerant in the system, Mr. Herkimer suggested writing to the chemical house from which the refrigerant had been purchased and said that correct information on the subject may be obtained.

The following telegram from Mr. E. A. Plesskott, of St. Louis, Mo., was then read by President Herkimer:

"Sincerely hope convention surpasses your fondest dreams of success and be the forerunner of many more. May it be the beginning of a still better cooperative spirit so vital in times as these. While unable to be with you in the flesh I shall be with you in spirit."

Secretary McDermott then announced that arrangements had been made for a visit to the plant of the Imperial Brass Manufacturing Co., Chicago, for the following day at two o'clock, immediately after the close of the day's session.

The next paper to be presented was prepared by Mr. R. J. Thompson, of Wilmington, Del., and read by Mr. R. L. Hendrickson, of Chicago. The subject of the paper was "Refrigerants" and dealt more particularly with the new gas "Freon."

In presenting the paper, Mr. Hendrickson drew a chart on the blackboard, which he used to illustrate several points. The paper will be printed in a future issue.

After the discussion on refrigerants several members suggested that the manufacturers could be of assistance in making tests and recommending proper drying agents for various refrigerants. Mr. H. V. Higley, of the Ansul Chemical Co., Marinette, Wis., stated that to his mind this would be a splendid idea and it would necessarily be a cooperative study by the manufacturers. He offered to take it upon himself to personally start work along this line.

In announcing his own paper, which was the last on the program for the day, President Herkimer said the subject with which he dealt, "Defining Refrigeration Servicing and Installation," had always been close to his heart for the future of the refrigeration service engineer, and all educators in its particular field. He expressed the opinion that

the definitions he would set forth in the paper would be instrumental in determining the position the service man should rightfully occupy. His paper follows:

Defining Refrigeration Servicing and Installation

The purpose of a dictionary is simply to explain the common accepted meaning of words; and the problem of which the dictionary professes to furnish the solution may be stated thus: The word being given to find the idea that it is intended to convey.

The idea aimed at in this paper is exactly the converse of this,—namely, the idea of servicing being given to find the word or words by which that idea may be best explained.

The communication of our thoughts by means of language, whether spoken or written, can not be acquired to perfection but by long and continued practice. What work the service engineer proposes to do and what the customer expects him to do depends either upon the gift of the service engineer in the power of expression—more often upon the power of silence.

However distinct may be our views, we often come to a point where we realize that we have not the words at our command to express them. The service engineer looks in vain for the words he needs which will faithfully specify the work he proposes to do. The right words can not be conjured up at will. Like "spirits from the vast deep" they come not when he calls and he is driven to the employment of words and phrases either too general or too limited to suit the occasion, and the result is a disappointed customer or a law suit.

Every workman in the exercise of his art should be provided with the proper tools. It is, therefore, essential to the success of the service engineer that he be provided with a vocabulary—with words that are definitely defined not by common usage but by the proper authority in the profession of *refrigeration servicing*. What more appropriate authority can there be than the Refrigeration Service Engineers' Society?

It is of the utmost importance that strict accuracy should regulate the service engineer's use of language and that every one should acquire the power or habit of expressing his thoughts with correctness. A misapplied or misunderstood term is sufficient to give rise to fierce and unending disputes; a misnomer has turned the tide of popular opinion; artful slogans have started wars and changed the destinies of empires.

I therefore propose that a committee be appointed to investigate and standardize the meanings of common refrigeration terms—in other words, to compile the first service engineer's dictionary.

I would be pleased to have all members present here today consider my definition of just two words, only the term, *Refrigeration Servicing*.

1. I would define *Refrigeration Servicing* as the mental act of diagnosing trouble by means of observations and the use of instruments which includes the connecting up of said instruments such as gauges, thermometers, etc.

2. I would define refrigeration service engineering as the practice of the *profession* of refrigeration service, but in no sense of the word, including the trade of remedying the trouble. Please note the use of the word *"profession."*

3. I would define the physical act of labor of remedying the trouble as the *trade of installation*, which may be called *"installation operation."* Please note the use of the word "trade."

At this point I suggest a definition in detail of the meaning of the term, *refrigeration servicing*, and which is used in the standard agreement submitted to the Society last year.

1. Note the general operation and condition of the installation with particular reference to operation of compressor, condenser and the condition of cooling coil, valve stem packing and seal making.

2. Check automatic control devices such as thermostats, expansion valves or float valves.

3. Check the condition of the refrigerant in the system as to pressures and quantity.

4. Check lubrication as required, and test for leaks.

5. Important temperatures are to be noted in refrigerators, ice cube chambers, etc.

6. The motive power of the installation is to be noted; condition of compressor, motor brushes, armature and belts.

7. To review the reports for the purpose of recommending:

1. Means for improving the operating economy of the installation.
2. The supplies and spare parts which should be ordered for installation.
3. New developments which can be advantageously added to the installation.

What does "Installation" mean?—It includes the physical act of labor of installation of any part: Oiling compressor, charging with gas, mixing brine, etc. It includes any physical act of labor for removing a part or material or adding a part or material. The physical act, removing of a part or material or adding a part or material, I therefor define as "installation."

What does "Maintenance" mean?—Maintenance implies the idea of cost of servicing plus the cost of installation, plus the furnishing of new material or parts. The cost of maintenance includes cost of material and labor.

"Let us call it 'Refrigeration Service Charge,'" he remarked at the conclusion of his paper. "It is a suggestion, and makes a profession out of it," he continued, "and as a member of our Society you can call yourself a professional man. It gives you a higher standing. Also, let us have our own dictionary with just one name for a particular piece of equipment—never two names—the word to be decided upon to be the recognized name or term."

President Herkimer then appointed a committee to consider and act on this suggestion, consisting of: Mr. C. E. Hamilton, Chicago; Mr. R. L. Hendrickson, Chicago; Mr. George H. Clark, Detroit; Mr. H. T. McDermott, Chicago; Mr. John Schaefer, Detroit; and Mr. Herbert Herkimer, New York.

The session then adjourned at 1:45 P. M. to reconvene Friday morning at 9:30 o'clock.

FRIDAY SESSION—OCTOBER 12, 1934

THE Friday morning session was called to order at 9:45 o'clock by President Herkimer. There being several new arrivals, he followed the same plan of the previous day and requested those present to introduce themselves and announce their home city. Mr. T. J. Fowler, President of Chicago Chapter, was called to the chair and took charge of the meeting. He assured all present that Chicago Chapter was highly elated to see the fine representation in attendance at the first annual meeting of the Society.

Chairman Fowler then talked extemporaneously on the subject, "Remedying Oil Bound Evaporators and Overcoming Excessive Dirt in Refrigerating Systems," as follows:

Dirt in Refrigerating Systems

"It is not my intention to make a talk telling you folks how this should be done. I want to handle this paper like we handle our educational programs in Chicago. I am going to say a few things about it and then I would like the members from the different Chapters to give their ideas on the subject.

"We know that in sulphur dioxide systems, due to moisture getting into the system from some reason or other, either through a seal or the condenser water coil leaking, filling the system full of moisture and creating what is known as a sulphurous deposit. There are a number of chemicals, as I understand, that are used for cleaning this. Our company in Chicago uses vinegar. We soak these parts in vinegar. Then they are washed and scrubbed in carbon tetrachloride and dried. I understand that some of the larger companies take a boiler or receiver or any part that can be removed and boil it in lye. They then clean out any remaining deposit and dry it.

"Some companies take the pipes after the evaporator is removed and loop them together with each boiler, then circulate an acid through them, which is supposed to remove that sulphurous or carbon deposit. We have never found anything that we could lay a bad sulphurous part in that would entirely remove the sulphurous acid without a scrubbing or some kind of rubbing action. That is, I am alluding to a pipe line going up through a wall. If we were to pump a solution through it, I am very doubtful whether it would remove all of the deposit. We have experimented with a lot of acids and they do not seem to remove the deposit unless you can get at it with a wire brush or something to get it out of there.

"You take the methyl chloride systems—I don't know around the country how much trouble you have had, but there was a scare some years ago before we had a detector agent, and methyl chloride was used. Several people were made sick through leaks. Companies then ran around in panic and put in sulphur dioxide as a detector agent.

"About a year later 'Artic A' came out. So, when a system needed a refrigerant after that, they put in Artic A on top of the sulphur dioxide. Most of you gentlemen who have come in contact with that know what it does. It forms a peculiar transparent coat on the inside of the boiler and on the valves of the machine and on the needles and after a certain time they become stuck fast just as badly as sulphur dioxide would stick them. That is just as difficult to get out as sulphur dioxide is. Those boilers have to be boiled, and if you do not remove all the deposit from the system it seems to travel back up. I know of one job in particular in which we cleaned several boilers and replaced the needles. They were Fedders boilers with a cartridge needle. About three or four months later these needles stuck again and they were just as bad at that time as they were the first time.

"The cleaning of a system which is dirty is quite a job. There are several ways of

doing it. Some people just remove the oil from the system, clean the compressor valves and the receiver and put in new needles and calibrate. But you will find, however, in a system that is sulphurous, that where the oil is in the boiler, there is no deposit in there. The water is just as clean inside there as the day it was made. It is a peculiar thing about the way it attacks the different parts of the system. It will get to the discharge valve and the pistons and down in the bearings and especially the needles and screens. So much for that.

"Now as regards the dirt in the system. You are all familiar with that. There isn't much to say about it. If a system is very dirty, you have to take it down and clean it. You have to clean the compressor, anyway. If the dirt isn't so severe you can very often put screens in the liquid lines and clean it up. In a short time you clear up the system."

At the conclusion of his talk, Mr. Fowler stated he would like to hear from the members as to their experiences pertaining to sulphurous deposit and dirt in the systems. Mr. George H. Clark said they have had numerous instances in Detroit where apartment house multiple systems caused considerable trouble due to excessive dirt and carbon lodging in the screens and the boilers which become corroded. In such cases, he said, they have been taking the boiler out of the system, cleaning the receiver and compressor and putting in fresh oil, attempting to fix it up that way. He said they have had fairly good results, especially if, in addition, they put a zinc or zinc oxide dryer or corrosion arrester in the system. A large screen will also help to remedy the trouble.

Cleaning Tubing

Mr. E. S. Wright, of Youngstown, Ohio, said he had something of interest to every one present. Shortly before he started to the convention he was called in on a job that had been using some old tubing. It had not been installed long enough to cause any hard corrosion, but they discovered the trouble. The owner did not want to go to the expense of tearing down the tubing and everything else connected with it. Mr. Wright said there was a man who had developed a rather novel method of cleaning beer coils, consisting of a tank about eight inches in diameter and thirty inches high. This he fills with about 200 lbs. of air. On top of this tank are two glass containers; one he fills with a solution and hooks it on to the line, turns on the air and shoots it through and back into the other container. By turning the valves he can reverse the action and shoot sand through with it.

On this job they took down the lines, disconnected and washed them with a caustic soda solution, shot the sand through and dried them out again, using compressed air and going over them with a blow-torch. After taking the compressor apart and cleaning as ordinarily, they then used B-B shot inside the receiver to loosen and blow out the coils, after which they tried out the job. After putting it back together, he said, they used a calcium chloride filler and dryer on it and when he left, the job had been working satisfactorily for four days. This had been the first time he had ever used that method and will try it again.

Chairman Fowler asked Mr. Wright if he was satisfied that they had removed all of the sand and he seemed satisfied that they had.

Mr. Paul Jacobsen, of Chicago, asked about the use of Freon in such a case and stated that Freon gas will loosen anything in the system.

Mr. Fowler said there might be an advantage in using it, but that in his opinion it would be expensive, and that he knew little about the dissolving qualities of Freon. He asked for further discussion on the subject. Another member said when it comes to a system that contains excessive dirt he was of the opinion that it is money and time saved by changing the lines and boiling out the evaporators.

Tetrachloride as Cleaner

It was suggested from the floor that the Educational Committee request the various Chapters to inquire of their local state universities regarding the handling of such jobs.

President Herkimer then said that not long since he had a machine which stuck and, whatever caused it, he wanted changed. They took a vertical receiver, half filled it with carbon tetrachloride, then used the old compressor that was pounding as an air pump to force the tetrachloride through the

whole system, recirculating it two or three times. He said they, of course, put a new compressor on and ran a vacuum on it for about a half-hour for the purpose of getting out all of the tetrachloride after it was filled with methyl—it is a vertical receiver, and is now working all right.

Mr. Meinke asked if the tetrachloride is dry or contains moisture, and was answered that it is supposed to be dry. He then said that he had frequently noticed rust in carbon tetrachloride containers; also, that at Madison, Wis., where he is located, is the home of the Wisconsin State University and one of the chemists there had advised him to put calcium chloride in the bottom of his carbon tetrachloride container. Mr. Meinke asked if there would be objection to that, whereupon Mr. Herkimer suggested that in such case it could be sent through a dryer. He also made the point that tetrachloride is used instead of gasoline only by service men who do a small amount of work, because gasoline does not contain much, if any, moisture in it. Mr. Herkimer likewise expressed the opinion that the safe thing to use is tetrachloride because of fire hazard.

Pressure Drop of Refrigerants Through Tubing

There was quite an extended discussion on related subjects, after which Chairman Fowler announced the next paper on the program, which was on the subject, "Discussion and Data on Pressure Drop of Refrigerants Through Tubing," by Mr. C. E. Hamilton, of Chicago. His paper dealt with the subject in a highly interesting manner.

In dealing with his subject, he said in part:

Friction losses increase rapidly with an increase in velocity. There is a limiting velocity with all liquids and fluids beyond which the losses are prohibitive, and to maintain these velocities an unusually high pressure must be maintained. On the other hand, it is not always practical to try and reduce the velocity to a minimum because of the increased size of pipes and fittings that must be used, and because the cost of this larger pipe or tubing might not warrant the gain in reduced friction losses.

It should be borne in mind that pressure loss is due to the friction of the gas or liquid in the pipes or tubes. The amount of friction, in turn, is affected by the size of the pipe or tubing, the velocity of the flow of the gas or liquid, the discharge and suction pressure in the system and the kind and condition of the pipe or tubing used in the installation. For low pressure refrigerants, copper tubing is very universally used. Copper tubing is available from most jobbers' stocks in sizes of ⅛", 5/16", ¼", 5/16", ⅜", 7/16", ½", ⅝" and ¾" O.D. O.D. stands for outside diameter, the size of a given piece of tube being found by measuring its outside diameter. Flared fittings are available over the same range of sizes. It is not usually deemed advisable to attempt to flare tubing larger than ¾", hence, flared fittings stop at that point. When larger than ¾" copper tubing or pipe is used, soldered fittings are usually employed. In the past, jobbers carrying a complete stock of brass fittings have had sizes up to and including 1¼" of the soldered type on hand. These jobbers are now increasing their stock to include fittings ranging from ¼" to 2⅛" O.D.

Capacity of a Pipe or Tube

In calculating the capacity of a pipe we consider the elementary pipe as a vessel of known capacity which is filled and emptied a certain number of times per minute or per second as the case may be. For example, a pipe one foot long with an end or cross-sectional area of one square foot holds exactly one cubic foot of liquid. If this is emptied once per minute, the flow is one cubic foot per minute. If the pipe has the same cross-sectional area but is 100 feet long and is emptied once per minute, then the discharge is 100 times as great or 100 cubic feet per minute. The velocity of the liquid is also 100 times greater since all of the 100 feet of liquid must pass through the orifice in one minute. In short, the total capacity or discharge in cubic feet per minute is equal to the cross-sectional area of the pipe in square feet multiplied by the velocity in feet per minute.

The average or mean velocity varies among pipes and tubes of different diameters for the wetted circumference of the pipe forms a greater percentage of the volume with small pipes than large ones; hence, the average velocity in a small pipe will be lower than in a large diameter pipe under the same conditions. In a small pipe, the average velocity may be only 30% of the theoretical maximum velocity while in a very large water main, for example, the average velocity may reach 90% of the maximum velocity at the center of the pipe. If we should measure the velocity at the center of the pipe, and then use this value for calculating the discharge, it would give us a figure greater than could be obtained under actual conditions.

The velocity through the lines is further effected by the number and type of fittings used. In small pipes and tubing, the resistance of one fitting will be about equal to that offered by three feet of tubing. As the size of the pipe or tubing and fittings increase, the ratio of resistance offered by the fittings

increases. As stated before, not only does the number of fittings effect the velocity, the frictional resistance and the resulting loss in pressure, but the kind or design of the fittings or valves have an effect. Valves of poor design may result in a pressure drop of 1½" or approximately 1 pound.

For small pipes used in small unit refrigeration systems, it is not safe to take the average velocity greater than 0.6 times maximum velocity at the center of the pipe; hence, for the average case we will have our average velocity equal to 0.6 times the velocity at the center of the pipe.

Pipe friction and pressure drop of refrigerants is not of much importance in a short run. Chiefly, it enters the picture in a long run and especially if a good portion of this run is vertical. Also, the friction losses are not of as great importance with liquid as with vapors. The chief reason for keeping down the velocity on the discharge side is to prevent pounding in the tubing, wire drawing in the valve and to reduce the head pressure required to maintain the velocity.

On the suction side of the system a minimum velocity of approximately 1000 feet per minute should be maintained to insure the proper return of oil to the compressor. The design and style of the cooling unit or evaporator effects to a certain extent the velocity in the low side of the system. The velocity at the outlet of the evaporator coil is usually maintained at approximately 2000 feet per minute. After the refrigerant passes through the refrigerant flow control, the velocity gradually increases until the refrigerant reaches the outlet of the coil. This is due to the absorption of heat by the liquid refrigerant and the forming of vapor as the liquid boils. With a velocity of 2000 feet per minute at the outlet, the average velocity throughout the coil will be approximately 1000 feet per minute. It has been found that the drop in pressure may be as much as 4 inches to 5 inches of mercury from one end of the coil to the other.

Condition of Bore

When the interior of a pipe is very smooth and without obstructions, the only pressure loss and velocity loss is due to the friction on the surface and the friction between the molecules of the fluid called *fluid friction*. With copper and brass pipes the interior is fairly smooth but in iron pipes the roughness increases and there is a very appreciable loss due to eddy currents set up by the surface. The velocity in an iron pipe is about 10% less than in a smooth seamless copper tube.

Hydraulic Head

In vertical pipes a pressure is created by the weight of a liquid downward so that the pressure must be increased over that required to overcome the friction in a horizontal pipe by the amount of this vertical pressure or hydraulic head. The actual pressure at any point in a vertical pipe due to the head depends upon the specific gravity or density of the fluid and its height above that point. If a liquid weighs ten pounds per cubic foot and rests on an area of one square foot, the height or head will be one foot and the pressure will be 10 pounds per square foot or 10/144 pounds per square inch. Now, if we increase the height or head to 2 feet, then we will have two cubic feet or 20 pounds pressing down upon the foot square surface or 20 pounds per square foot pressure. Thus, by multiplying the weight of a cubic foot of liquid by its head in feet we get the pressure per square foot. Likewise the pressure per square inch can be obtained by dividing the figure by 144, the number of square inches per square foot. This means then that the total frictional losses to be considered are the fluid friction plus the hydraulic head. If the pressure on the high side of the system falls below this total, there will not be sufficient pressure to fill the entire liquid line with refrigerant. Hence, vaporization of the refrigerant will take place in the liquid line. The design and efficiency of a condenser has much to do with the pressure maintained in the high side of the system. However, nothing is gained by having a condenser of such perfect design that it would reduce the head pressure below that required to overcome the total frictional losses.

Mr. Hamilton then illustrated on the blackboard his discussion by a drawing of a system showing the pressures throughout the system under standard conditions, that is, 86° liquid and 5° vapor.

Ice Cream Cabinet Servicing

Chairman Fowler complimented Mr. Hamilton very highly, after which he announced the next paper, "Ice Cream Cabinet Servicing," by Mr. Paul Jacobsen. He said in part:

The first popular or generally used ice cream cabinets were made by the Nizer Corp. of Detroit, Mich. These cabinets were made in one style only, namely, the self-contained water cooled type in sizes of 4, 6, and 8 hole capacity, meaning they would hold 4, 6 or 8 five gallon cans of ice cream.

Later the demand for different sizes required that a variety of cabinets be had on hand and today they may be had in almost any size, style or form, as straight ice cream coolers or in combination with milk or water coolers and with compartments of various temperatures, etc.

The actual field service on ice cream cabinets is no more difficult than service on a domestic refrigerator but it requires a more thorough knowledge on the service man's

part, as ice cream is a very perishable product which starts spoiling when the temperature reaches 12° F., and if allowed to reach higher temperatures will become "mushy" and soft and when cooled down again and hardened will lose its smooth texture and become "icy and gritty" and very unpalatable, so we see that when servicing ice cream cabinets the service man must be a man who knows and who can put his finger on the trouble immediately and correct it in a short period of time.

Competent Service Men

Looking at the problems from an ice cream manufacturer's or a cabinet owner's standpoint, how can we as service and installation men serve them so they will have the best possible installation made and the least amount of service on this machine, or rather, the least amount of trouble and consequently spoiled ice cream on each particular installation? First, by employing only competent mechanics; second, by installing the cabinet and machine in the most suitable place for the machine, and third, by having the equipment inspected every month.

Employing only competent mechanics will pay big returns in the course of a year to the cabinet owner. The installation of an ice cream cabinet is a most important factor as a poor installation or a machine installed in the wrong place absolutely determines whether the user is going to have good or poor service out of their cabinets. An installation should be made so that it is at all times readily accessible for service.

Installing the Job

The copper tubing used on the job should be run in a workmanlike way with soft bends where necessary and on the straight runs the tubing should be kept straight sloping slightly towards the machine to provide proper oil return.

Scale traps should be installed on the lines to prevent dirt from getting into the cabinet or the machine.

Proper shut-off valves should be installed where there are more than one cooling unit connected to the machine so that each and every unit may be shut off individually.

A switch box with fuses should be placed near the machine so that if anything goes wrong it may be readily shut down.

The cabinet should be placed level and if it is a brine tank cabinet it should be filled with the recommended solution to a level above the cooling unit inside of the cabinet.

When the installation has been made and the machine started it is advisable to purge the machine after about fifteen minutes' running to remove any noncondensable gases there might be in the system.

Check the machine for operation, gas leaks, and pumping capacity, see that the motor is oiled properly, check back on the job the following day to give final going over, to adjust controls.

If this has been done properly and the conditions are right for the machine there is every chance in the world that this installation is going to work right, that your customer is going to be a satisfied customer and that you have added something to your prestige that money cannot buy.

By having the equipment inspected every month you prevent trouble. What does this inspection service mean? It means that we give the equipment longer life:

Inspection Service

1. By keeping the machine and especially the condensers on either air or water cooled machines clean so that they may work to their full capacity. Dust in an air-cooled condenser and dirt in the strainer on a water cooled machine cut down the capacity of the machine very rapidly.

2. By oiling the motor bearings we prevent them from wearing out. Properly oiled motor bearings will last from 8-10 years. Improperly oiled bearings from 6 months to 2 years.

3. By keeping the belt tight we get longer life out of it and also better traction, which in turn means less running time for the machine. We can also get a chance to change the belt before it breaks and such makes a service call.

4. By checking the amount of gas in the system. Almost all systems lose a little gas all the time; it may be so little that it is hard to find the leaks, but sooner or later some gas must be added to the machine and inspection service will tell you when this is necessary.

5. By checking the operation of all the valves in the system. It is not often that a valve goes bad altogether, it first becomes inefficient and if allowed to keep operating it will give out some day. Have it repaired or exchanged on this inspection service and keep the machine up to capacity.

6. By purging the machine for noncondensable gases which may accumulate from time to time we prevent these gases from building up undue high pressures on the machine.

7. By checking strainers and scale traps so that they will not clog up and so cut down the capacity of the machine.

8. By checking motor brushes and commutator that they will not give trouble during the starting periods of the machine and so burn the motor up.

9. By checking the fuses in the fuse box. They may have been changed to a heavier fuse which would be no protection for the motor.

10. By checking the oil level in the compressor that it may not run dry due to shift-

ing of oil from the crank-case to the receiver or cooling unit.

11. By making whatever changes desired in control adjustments to suit the season and the customers' needs.

12. By preventing deterioration of the machine and cabinet from rust and corrosion. (A little paint works wonders.)

13. By checking the brine level seeing that no undue evaporation has taken place and also checking the consistency of the brine that the solution is not too weak and runs danger of freezing.

14. By building up good-will between your company and the customer for some future time when this good-will may be needed.

Service

If everything mentioned under the headings of installation and inspection has been followed, the service problems on an ice cream cabinet are very small. There are three things which may cause a service call—power failure, gas leak, adjustment. Blown fuse, no current, or switch shut off. Tubing split or worn—seal worn. Quick change in weather conditions and sales may necessitate controls to be set colder.

So we see that service calls are becoming a minor problem when the machines are taken care of from the start.

At the conclusion of Mr. Jacobsen's paper, Mr. W. W. Hamilton, of Chicago, was pleased to speak in reference to it from the ice cream man's point of view. He said that a complete evolution of the ice cream industry has taken place within a short period of time. The early cabinets on the market in this territory (Illinois, Michigan, etc.) gave very good results; however, the same cabinets in Texas, etc., where the temperature was often 105°, they fell down completely.

Mr. Hamilton said we had gone through a very severe test of ice cream refrigeration during the past year, especially for a few weeks when the temperature reached 105° or higher, and when ice cream cabinets or soda fountains fell down during such a period, or the hottest days of the year, the refrigerating equipment in the eyes of the ice cream manufacturer is absolutely condemned. He warned the members that when servicing an ice cream cabinet and there is a loss of $50.00 or $60.00 to an ice cream man their service is looked upon with great discredit. He expressed the opinion that the question of ice cream cabinet service deserves close study by the Refrigeration Service Engineers' Society, because the ice cream man is entirely dependent upon the condition in which his product reaches the public.

Chairman Fowler announced the next paper, "Thermostatic Expansion Valves," by Mr. Dan Wile of Detroit, which will be published later.

Commercial Low Sides

The next speaker on the program was Mr. Joe Askin, of the Fedders Manufacturing Co., Inc., Buffalo, New York, who presented a paper on the subject, "Commercial Low Sides," which was followed by numerous questions which he was pleased to answer.

He expressed the belief that all present were acquainted with the various types of commercial low sides in use today and then briefly described them. He said it would take a much longer period of time than had been allotted him to do justice to any one of the various types, but he reviewed them briefly, discussing them one by one in the order that they had been introduced to the refrigeration industry, but said that no doubt at some time each one present had ingeniously worked out his own commercial low side. Mr. Askin said that he had enjoyed an unusual opportunity to observe the development of the various types and then proceeded by use of several slides to show them and to speak interestingly on his subject. His talk was most instructive.

At the conclusion of Mr. Askin's paper and the discussions which followed, Chairman Fowler announced the next speaker, Mr. J. B. Cook, of Chicago, who addressed the members on the subject, "Accounting Systems for Service Organizations," which proved to be exceptionally interesting and instructive. This paper is published on another page of this issue.

Controls

The last speaker on the day's program was Mr. L. B. Miller, of the Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. His paper was under the caption, "Controls," and dwelt on the work his company has done in connection principally with air conditioning controls. It was very interesting as evidenced by the close attention he was accorded.

Mr. Miller said it is obvious that his subject is so broad that any discussion of it must of necessity be very brief. At the same time, he continued, the members' line of endeavor naturally prompts a very keen interest in the refrigeration controls. He, therefore, briefly mentioned the general conditions as applying to those controls and then to outline somewhat more in detail some of the work which his organization has done and is at the present time carrying on in connection of controls systems as applied to air conditioning installations.

Classifications of Refrigeration Controls

He said there as two general classifications of refrigeration controls; first, those controls for domestic refrigeration equipment, and, second, those for commercial and industrial types of installations. In breaking these down further, there are two sub-classifications; first, refrigerant controls which have to do with the regulation of the refrigerant, and, second, fixture controls which have to do with the regulation of temperature in fixtures, these instruments being either the pressure or temperature type.

Mr. Miller then explained that there are three general types of refrigerant controls to be found in domestic boxes—expansion valves, low side floats and high side floats. In considering "fixture control," he said, insofar as this type of unit is concerned, the temperature is almost universally used.

In discussing the commercial types he considered it would be advisable to speak first of the units that are applicable to sulphur dioxide, methyl chloride and F12 in this portion of the discussion and then referred in general to those applicable to ammonia systems later.

Fixture controls were then considered. Pressure controls applied to the low side for regulation of the condensing equipment, mechanically, still remain conventional. This applies to those controls that are used in commercial installations. For controls used in Freon in air conditioning work it has been necessary to increase the range of operation. It has also been found advisable to widen the differentials under which these controls must work in order to care particularly for the wider limits of suction pressure imposed by Freon when in connection with this type of installation.

Combination Controls

Combination pressure controls with pressure cut-out; thermostats, self-contained type and remote type, were also considered, as were thermostats, high pressure cut-outs, humidity controls, electrical refinement, etc. Air conditioning controls were also considered as was floating control which was shown on the screen, as was modulating or proportioning control, two-position control, as was a comfort chart for air velocities.

Mr. Miller's paper was highly comprehensive and he expressed the hope that the solution of several difficult control problems had been suggested to the members by him.

Before adjourning the session, Chairman Fowler again announced the trip to the plant of the Imperial Brass Manufacturing Co.

The session adjourned at 1:45 P. M.

SATURDAY SESSION—OCTOBER 13, 1934

THE final session of the convention was called to order at 9:30 o'clock Saturday morning, Mr. Fowler presiding. The first item on the program was consideration of the Question Box, Secretary McDermott reading the questions that had been deposited by the members. Some of these questions with their answers appear in the "Question Box" of this issue.

The first talk was on the subject of "Air Conditioning," by Mr. C. A. Rickner of the E. Vernon Hill Co., Chicago, who considered the various phases of the subject.

"First, all present here have, no doubt, been called upon at various times to express their opinions on various types of jobs," Mr. Rickner said. "Primarily, a complete air conditioning system is a system that will give the most healthful and comfortable results. That might be a short definition that will cover the question, but a number of manufacturers have divided air conditioning into two separate and distinct types. One is your summer air conditioning and the other is your winter air conditioning. From a health standpoint winter air conditioning

is a little more important, because in the winter time the low relative humidity which exists in the average home, building, or office, when the outside temperature is quite low, is more harmful than the high humidities we have in the summer. There is also the fact that we have a higher mortality rate, more deaths and diseases in the winter. The doctors say the reason is because we do not get enough outside air that there are so many diseases in the winter time. It is not altogether a case of getting enough outside air or fresh air; it is because of climatic conditions that exist within the building or structures where we live."

Mr. Rickner discussed the subject in a more or less general way that was highly informative and interesting.

Following him, Chairman Fowler next announced Mr. W. Stark of the Cutler-Hammer Co., Milwaukee, Wis., who presented an instructive paper entitled "Domestic Refrigerator Controls," which brought forth much favorable comment. He showed samples of various "cold controls" for domestic refrigerators and explained their various mechanisms and operations.

At this time President Herkimer assumed the chair. He announced the next paper, which was by Mr. James H. Downs, of Detroit, entitled "Estimating Repairs and Installations," which is printed on another page of this issue.

President Herkimer complimented Mr. Downs on the high character of his paper and its value to the membership of the Society. The paper to Mr. Herkimer's mind presented the thought that the organization could well have a committee on salesmanship, but said that feature can be taken care of for the present by the local Chapters.

The next paper that followed was, "Determining the Rate of Service Charges," by Mr. Harry D. Busby, of Chicago. Before proceeding with his paper he complimented Mr. Downs' talk in high terms, which he said was very interesting to him. He also referred to Mr. Cook's paper on the importance of accounting and said that if all of the members had an adequate accounting system as Mr. Cook had recommended his own paper would be out of place, but since many of the small operating companies have very little cost data to guide them in determining a rate of service charge, he hoped his own paper (which he read) would be of assistance in helping to set up or determine what a fair service charge would be.

Mr. Busby's paper will be printed by the Society as a regular bulletin and circulated to the membership.

President Herkimer then called for the various committee reports. First was the report of the Auditing Committee, read by Mr. Fowler, chairman of the committee, to the effect that inspection of the books of the Secretary and Treasurer had been made and that the committee had found them to be correct.

Next, Chairman Evans read the report of the Credentials Committee, which was likewise accepted, as was the report of the Resolutions Committee, presented by its chairman, Mr. Brunton, as follows:

Report of Resolutions Committee

To the Officers and Members of the Refrigeration Service Engineers' Society:

Your Resolutions Committee offers for your consideration the following Resolutions:

BE IT RESOLVED, That a vote of thanks be extended to the National President, Mr. H. Herkimer, and other officers of the National body for their efforts and time spent; also to Mr. J. F. Nickerson, publisher of our Official Organ, for his interest in organizing this Society.

BE IT FURTHER RESOLVED, That a vote of thanks be extended to Chicago Chapter for the use of its meeting place and hospitality extended to the visitors and members at the First Convention. Be it further

RESOLVED, That a letter of appreciation be sent to all of those who participated in the educational program. Be it further

RESOLVED, That the different members be thanked through the Official Organ for their attendance and the support they have given.

CLAUDE A. BRUNTON,
HARRY D. BUSBY,
EVAN L. HUGHES,
Resolutions Committee.

Report of the Nominating Committee

The report of the Nominating Committee was next read by Mr. Skipple and resulted in the unanimous election of the following officers and directors:

Officers

President, T. J. Fowler, Oak Park, Ill.

First Vice-President, J. H. Downs, Detroit, Mich.

Second Vice-President, G. D. Wang, Milwaukee, Wis.

Treasurer, E. J. Merenda, Brooklyn, N. Y.

Secretary, H. T. McDermott, Chicago, Ill.

Sergeant-at-Arms, A. J. Robins, St. Louis, Mo.

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H. D. Busby, Chicago, Ill.

C. A. Brunton, Huntington, W. Va.

D. W. Walters, Eau Claire, Wis.

Following the committee reports, President Herkimer called for remarks from various members concerning the good of the Society.

Educational Activities

Mr. Fowler again took the chair at this time and called for a talk by Mr. George H. Clark, chairman of the Educational Committee. He discussed the problems of the committee, its hopes for the future, including the desire to prepare and issue a lecture course on refrigeration. He said his opinion was that the man who knows some theory as well as practice, understanding everything he does in practice, and can unite the two, he will have a more thorough understanding of his subject than he can possibly acquire any other way.

Mr. Clark said it is the purpose of the Board in this connection to publish monthly educational bulletins, the second of which is already printed. Another important thing the Society has in mind is the examination part of the educational work. According to the objects of the Society—the way it was organized—there are to be different grades of membership. That is, there is the active member and the certificate member. The latter shall be a man who is well above the average in ability to analyze service trouble and take care of it, and for this should be able to pass a suitable examination which shows he possesses a reasonably thorough knowledge of his subject and that he has had practical experience. The plans on this are not entirely complete as yet, but the examination will be thorough. It is the purpose of the Society, Mr. Clark continued, to elevate the members and increase their knowledge of their business so that they can eventually pass the examination which is desired to be a real mark of distinction.

Following Mr. Clark's interesting talk and the discussion of various constructive points in connection with the educational work, Chairman Fowler announced that the receiving of invitation from cities desiring to entertain the Association's 1935 convention were in order.

Secretary McDermott explained that after the invitations were received, according to the Constitution and By-Laws, they are turned over to the Board of Directors for consideration as of all the facilities offered which then determines where the convention will be held, and must be announced at least ninety days before the convention.

Mr. Herman Goldberg, of Chicago, spoke for Detroit, and subsequent action by the Board of Directors confirmed the holding of the next convention in that city, the date to be decided upon later.

The program was again resumed and Mr. A. F. Haesel, of Chicago, read a short paper on "Evaporators and Fin Coils," which was interestingly discussed at considerable length.

Evaporators and Fin Coils

Mr. Haesel said in part:

In the heat transfer from a refrigerated compartment to a heat absorber such as bare pipe or finned coils, we are primarily concerned with two factors, the first being the amount of surface and the second being the temperature difference between the surface and the air being cooled.

The smaller the temperature difference, the more efficient becomes the refrigerating system. The smaller the temperature difference the greater the amount of surface which has to be employed, The economic consideration of capital costs tends to keep the surface at a minimum, this, conflicting with the ideal condition, then forces us to use all possible available methods to increase the efficiency of the surface to be used.

One of the best methods to increase coil efficiency is by the use of heat exchangers at the coil outlet for cooling the refrigerant liquid prior to its passage through the expansion valve.

I am not referring to some types of heat exchangers, which merely serve to superheat the vapor leaving the coils to a sufficiently high enough temperature to prevent sweating of the suction lines, but I do refer to heat

exchangers, which, while preventing sweaty suction lines, cool the refrigerant liquid, prior to its passage through the expansion valve, very close to the temperature of the refrigerant liquid in the tubes.

When we realize that from 15% to 35% of the entire amount of vapor leaving a coil is immediately generated at the expansion valve in cooling the liquid only, we can readily realize that this tends to cut down the efficiency, because all this vapor must traverse the coil to its outlet. If the coil is large and the tubes are in series, there then exists quite a pressure difference between the inlet and outlet of the coil, which cuts down the efficiency.

A coil with no heat exchangers or with those of inadequate capacity will always have a higher temperature at the outlet as compared with the inlet. Of course in the above it is assumed that thermostatic expansion valves are used as commonly adjusted.

A coil, with a proper heat exchanger of sufficient capacity to cool the refrigerant liquid properly, will have its outlet temperature lower than its inlet temperature and the entire surface will then be operating at maximum efficiency for the particular conditions.

Heat Transmission of Metals

According to all text books on heat transmission, copper has a thermal conductivity practically twice that of aluminum, yet no one would be rash enough to claim that a copper finned coil could be half as small as an aluminum finned coil. From actual tests over an extended period of time, we have finally arrived at the conclusion that there is, all other things being equal, practically no difference between the two different metals. We do not doubt that under very high heat load per unit area, such as would never be encountered in refrigeration, the copper fin would show a marked superiority.

Most of us might assume, because a coil is practically 100% frosted, that all of the surface is operating at equivalent efficiency. This is far from the truth, because a considerable portion of the coil near the outlet end might be operating at a 3° to 4° differential, and if the air temperature were 35° there would still be frost upon those portions. This is especially true of fin coils having fins, which are common to all of the refrigerant tubes, because conduction from the low temperature portion of the fin tends to absorb heat from the higher temperature portion.

We all know that the greatest efficiency occurs whenever all possible of the surface is wetted by the refrigerant liquid. It is obvious that, without resort to some means or other, no series circuit coil can have anywhere near 100% wetted surface on the inside of the tubes. The vapor volume, which is continually increasing toward the outlet, must displace some of the liquid volume.

At present we are experimenting with and so far have had installed several hundred coils equipped with internal spiral ribbon. The theory is that the vapor and liquid having a velocity through the coil, the liquid tends to separate from the vapor due to centrifugal action and thereby hugs all of the internal tube wall, allowing the vapor to pass through the center of the tube. Two similar coils, but one with the spiral ribbon and one without, show, when tested, a decided advantage for the one so equipped.

As part of the discussion Chairman Herkimer called on Mr. G. S. Bataille of the Rempe Company, Chicago, who talked interestingly on the subject and at considerable length. He spoke particularly of a coil that is being developed by some of the larger air conditioning manufacturers—a small steel coil; that is, steel fins on steel tube. He said his firm is not making that type of coil as yet, but has its eyes on it and will go into it, for it seems to be the accepted coil. He said he gave the information, not from a sales point, but from an educational point of view. His talk on fin type coils was decidedly instructive.

President Herkimer at this time announced that members desiring any information relative to air conditioning were invited to write the Educational Committee. He then announced the election of officers to be in order and again read the nominations offered by the Nominating Committee, and appointed Mr. Jacobsen and Mr. Goldberg as tellers.

Election of Officers

The nominees as announced were unanimously elected.

During the progress of the election, Mr. E. E. Brand, of L. Sonneborn Sons, Inc., Chicago, was called on to present his paper, which was on the subject, "Lubrication of Mechanical Refrigerators," and which he abstracted and which was exceedingly instructive. The discussion by the members which followed took into consideration the viscosity, temperatures and the various types and characteristics.

Mr. Brand's very instructive paper with its discussions will be printed in full in a future issue.

President Herkimer then took the opportunity to announce the result of the election

of officers which was unanimously in favor of the candidates offered in the Nominating Committee's report. All were declared elected amid the applause of the convention. He called on the new president, Mr. Fowler, who sincerely thanked the membership for the honor they had shown him, and called attention to the fact that all past presidents of the Society at the expiration of their term of office automatically become members of the Advisory Board.

The other newly elected officers were likewise called upon, and all expressed their appreciation of the honor received and spoke encouragingly as to the future prospect of the organization, pledging their best efforts to further its future growth.

The first annual meeting of the Refrigeration Service Engineers' Society was then adjourned at 2:10 P. M. Saturday, October 13, 1934.

Estimating Repairs and Installations

By J. H. DOWNS,
First Vice-President
Refrigeration Service Engineers' Society

The Refrigeration Service Business Requires Good Salesmanship. Rather Lose a Job Than Do Inferior Work.

MY remarks are not intended to turn your business from a bread and butter proposition into a real honest-to-God million dollar organization. I haven't been outstandingly successful myself and what observations I have are necessarily made from my own business, which consists of over five years of independent service and would include, I think, about every mistake it is possible for a service organization to make. So I feel I am qualified to at least tell you some of the things not to do if I can't tell you what you should do.

Now what business I have, I have built on the idea of doing a good job of work and then expecting the customer to pay a fair price for it. Now just among us fellows, to be altogether honest, it isn't possible to get a fair price for labor charges in our city. It has been my experience that my chargeable hours to the customer on the average over a year's time wouldn't exceed 4½ hours per day. Now at $1.50 an hour, it is very simple to figure out that is only $6.75, out of which I have to buy my bread and butter and maybe a little gasoline for my car and buy a new car once in a while, and I have my telephone bill to pay, which in my case costs about 75c a day, and I have to pay the salary of the office girl and the helper in the shop, so that $6.75, even though I have at the present time one other man and usually two or three other men working with me, and even though they bring in $6.75, still it doesn't leave me anything. So I have to depend a good bit on the sale of parts and making a pretty good sized profit on parts.

We can take a leaf from the plumbing industry, which figures it needs a 100% profit on any part they sell, that is, 100% on the selling price. Any part that costs them $1.00, they will sell it for at least $2.00. I have heard a lot of fellows talk about robbing the customer. They will tell about a job somebody else did, where he installed a part that only cost him $2.00 and he sold it for $12.00 and he was robbing the customer. Perhaps they didn't take into consideration the fact although the part only cost $2.00, yet it might actually be worth, if he were forced to replace it from some other source, the wholesale price of $8.00 or $9.00. So I don't think it is fair to consider the cost of a part at actually what you are able to pick up a part for at a bargain sale or something like that. I think it should be based on the replacement price. And I think on that basis we should make 100%.

Take methyl chloride and sulphur dioxide. We multiply the profit on that several times.

We have to, because we have our losses. We have the losses in charging the machines. Every time we charge a drum we lose a little gas. We charge a methyl chloride machine after deciding we have all the leaks fixed, find it is leaking somewhere else, and go back and replace that gas at no charge. At least, I have to. I haven't found any way of making the customer pay for it.

So the first point in making an estimate for installation work, the first thing you must consider, is the actual cost of the material which you are going to use in this job. The second thing is knowing just what it costs you to operate.

Cost of Doing Business

Now I think it is only right and only a businesslike method that every one operating a service company, regardless of whether it is a one-man organization or fifty, should allow himself a fair salary and figure that as a fair cost of doing business, and not consider at the end of the week, if he has $50.00 left after he has paid his help, that he has made $50.00; and if he has $25.00 left next week, he has made $25.00. We all have our good weeks and our bad weeks. We are a little too much inclined to be quite optimistic when we have a good week and a little down in the mouth when ue have a bad week.

Now I am not exactly high priced help but every week in my accounting system I charge a fixed amount to the salary account. If I haven't done enough business at the end of the week to pay the salaries and the other expenses, then my business hasn't operated at a profit, I have had a loss; if I make more than my salary and expenses the next week, then I have made a profit that week. And I think you will find that is the only businesslike way to do it. You have to consider your salary at a fixed rate as part of your cost as well as the salary of everyone else.

Now the knowledge of the cost of the material is quite an easy thing to handle. We all get catalogues from the parts dealer and we can tell quite readily just what a piece of material is going to cost us and, by figuring the operating expenses, you can arrive at a fair profit. You may not get 100% on the cost price. It is not always easy to get. But whatever it is, it is easy to establish a fair price.

The knowledge of the cost of operating I think is one of our weakest points in this business. Most of us have gotten into this business from the service angle rather than from the business angle. I was formerly a service man with the Kelvinator Corporation, decided this should be a good business and got into it from that angle. And for a long time my books were of the very sketchiest sort. I couldn't have told you within 14 days' time what I was worth. It would have taken about that length of time to have figured it out, and then it would have been pretty much of a guesswork proposition. But, thanks to several bad experiences, I think most of us are beginning to realize books are as important a part of the business as the actual servicing end of it. So we can arrive now by a little study at just what our cost of operation is.

Estimating Jobs

Now a knowledge of machinery is, of course, of primary importance. I have kept this until the third point because I feel most of us are well qualified in that respect. That is, that has been our line of business. We learned that before we learned anything else about the business. So when we make an estimate and decide what is necessary, that is probably the easiest point. So, I won't give that much attention.

The final thing of making an estimate and putting it across is actually the selling end of it. Any one of us here can go out and decide what an ice machine needs, what it ought to have to put it in good condition. We can tell the customer what it needs but can we sell him on that? Can we sell him so we can convince the customer that what we tell him he needs is exactly what he needs and the price we quote him on it is a fair and honest price, and, lastly, that we will do a good job and do a job that will stand up and give him his value dollar for dollar?

Now that is quite a difficult point. We are none of us psychologists and not very many of us have done a whole lot of selling work, that is, a strictly selling proposition. But as we go along we learn a little bit more about human nature and learn just about how to

handle our particular customers. But I have found in these cases where one company or one person will call for estimates from maybe 10 or 15 service companies, that a proper job of selling will sell that job. That in most cases it isn't a case of strictly who has the lowest price—it is a case of who can sell himself to the prospect, who can convince the prospect he is the logical choice to do this job.

Now that is pretty difficult in the case of large companies. However, I have tried to get at the one myself who actually does the buying rather than deal through a stenographer or someone like that. You will never find that very satisfactory, I don't believe.

Handling Calls

If you get a request through the mail for an estimate, I don't think you stand one chance in a hundred if you just mail in your estimate with your name and address and telephone number and depend upon the sagacity of the buyer to choose you, unless you get the work through a low price. Because a low price, there is no question about it, will get a certain amount of work.

We are all familiar with the fellow who calls up on the telephone and says, "I have a Frigidaire machine and I need some gas in it. How much are you going to charge for that?" I used to spend quite a lot of time trying to convince that man I was the man to do the job and that while I couldn't give him a definite figure then, I would give him a good job at a fair price. However, I think you will find you are wasting your time in 90% of those cases. Now if somebody calls up and wants to know how much I charge an hour, I tell him my price is $1.50. If he says, "Too much," I say, "All right, you will have to get somebody else, then." Don't spend any time on a call like that because he is just trying to chisel you, anyway, and if a man hasn't nerve to ask a fair price for his work, he isn't going to get the work.

Any doctor who does cut-rate work, any dentist who does cut-rate work, like a whole lot of these dentists have out signs that they pull teeth for 50c and so on, none of us have a whole lot of confidence in them. We have confidence in the man who has the courage to ask his price and really stand behind his work when he gets through. And you will find that is true in our line the same as any other.

In determining these troubles, the thing we run into, of course, is the unseen trouble. We have a look at the machine and find out it is out of gas. Maybe it will cost us a little gas to put in to the system to see where it goes. We find where the gas leak is. But we can't give an estimate until we decide whether the expansion valve or float valve is all right. We have to make a guess with regard to the thermostat. We put a little more gas in it. And before we get through we have run up considerable expense in gas. Whenever we go out to make an estimate, we are putting up merchandise and time and the cost of our car and it is only fair the customer should pay for that.

Now our policy is this. We have a request for an estimate. "Yes, Mr. Jones, we service Icy-Cold Refrigerators."

"Well, I would like to know about what this is going to cost."

Service Charge

"We would be glad to send out Mr. So and So. He will tell you exactly what it will cost. It is impossible to tell you over the 'phone, but our Mr. So and So will tell you exactly what it will cost you. There will be a charge for this. It will be $1.50. The terms will be cash. If you decide to have the work done in 30 days, we will be glad to credit that $1.50 to it."

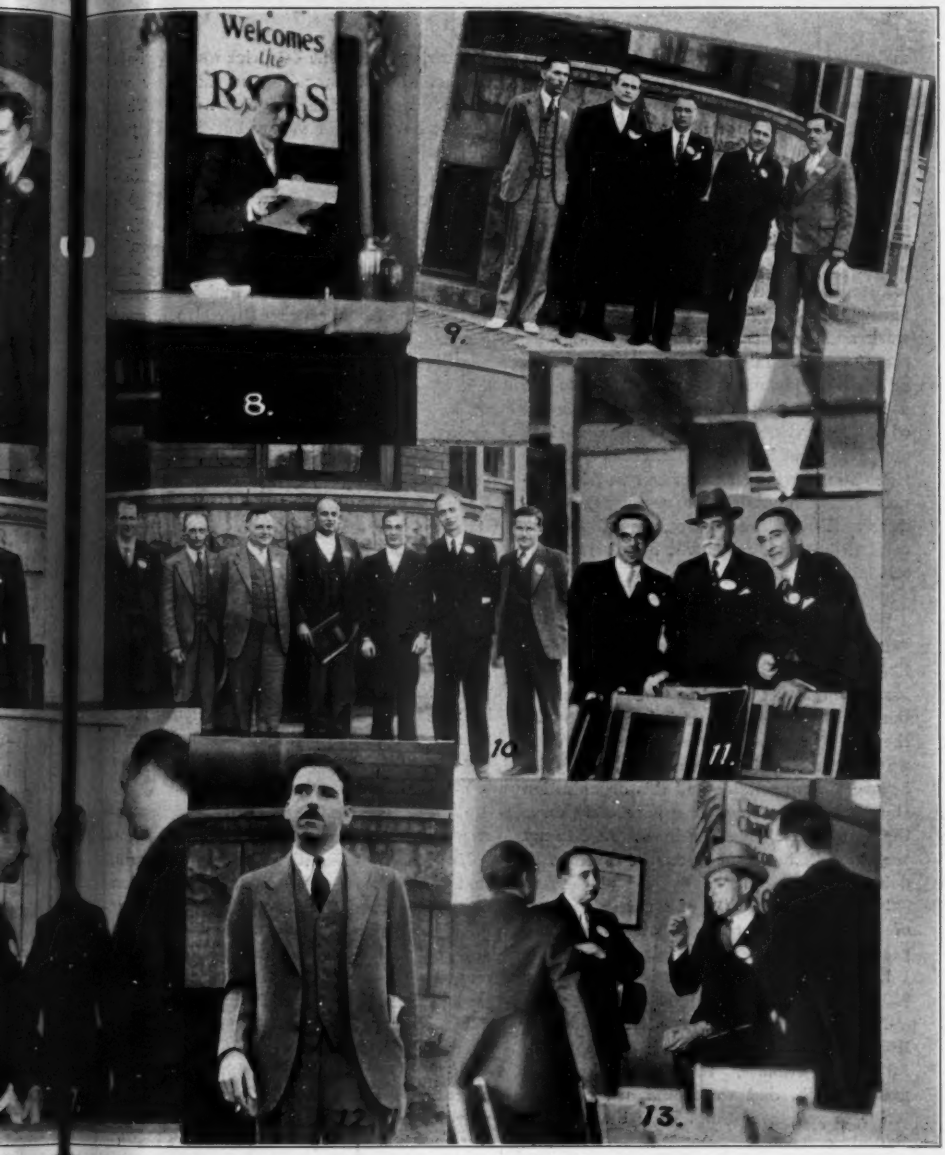
Now that is a "weak-kneed" sales effort but we are forced into it by our competitors. They do the same thing. I don't think there should be any rebate any more than you should ask a doctor to diagnose free.

Now it isn't right that we should be forced to give an iron-bound estimate. We are in the same position as the doctor. He can't tell you what he will run into. He can make a pretty good guess. But we are up against that situation and we might as well face it.

It goes without saying we are all in the business to make a fair profit and secure our future. I don't think any of us want to carry a service kit all our lives. I know I don't. When I get older or a little more

PERSONALITIES AT THE R. S. E. S. CONVENTION

(1) Some Detroit Chapter members—Geo. H. Clark; R. Tudhope; Evan L. Hughes; James H. Downs, President, Detroit Chapter and First Vice-President National Society; E. C. McKerracher, Orbie Evans. (2) President-Elect T. J. Fowler has something to say to Ivar Skipple, Chicago, left, and Herman Goldberg, Chicago, right. (3) Geo. H. Clark, Chairman National Educational Committee, discusses future plans of the work of his Educational Committee. (4) A few of the St. Louis Chapter members—John Eichhorn; Russell E. Davis, Secretary St. Louis Chapter; Manuel Brown. (5) Claude A. Brunton, Huntington, W. Va., member, National Board of Directors, discusses with Thomas L. Carnell, Atlanta, Ga., subjects of interest. (6) R. L. Hendrickson, Chicago, reads paper on Refrigerants. (7) Marc Shantz, Fedders Mfg. Co., discusses "Non-Frost" coils with E. J. Merenda, New York City, left, and Herbert Herkimer,



New York City, right. (8) Past-President Herkimer delivers the President's Address in opening the convention. (9) Some of the Milwaukee delegation—Ellsworth Anderson; Henry Miller; G. D. Wang, President Milwaukee Chapter and Second Vice-President National Society; C. Buschkopf, Beaver Dam, Wisc.; Jack Geering. (10) Different geographical locations represented in this picture—Warren W. Farr, Lakewood, Ohio; A. G. Ellingson, Cedar Rapids, Ia.; R. I. Masten, Cedar Rapids, Ia.; W. H. Moss and W. E. Smith, Jr., Memphis, Tenn.; Alfred J. Meinke, Madison, Wisc.; R. R. Koepsell, Cedar Rapids, Ia. (11) Harry J. DeGan, Treasurer Chicago Chapter; J. F. Nickerson, Publisher, The Refrigeration Service Engineer, and George Monjian, Chicago. (12) Dan "It Keeps the Coil Completely Refrigerated" Wile, Detroit Lubricator Co. (13) An informal discussion—Herbert Herkimer with back to camera; Eldon S. Wright, Youngstown, O.; James H. Downs, Detroit, Mich.

mature, I would like to be able to operate the business and eventually retire from it, and have a little money left over with which maybe I can buy myself a package of cigarettes once in a while. So I am not considering the class of business which is organized merely as a stop-gap, the man who gets out of work today and is in the business tomorrow until he can find a job and then he is out again. That class of competition will only kill itself off. The only successful means of fighting that competition is by selling quality work and convincing the customer that we can give it to him and we are reliable. It is all right to try other measures. There are a lot of things tried to force a man out of business. But any man who is competent and does what he says he will and does the right thing by the customer can stay in business and can secure the customer's confidence. But the cut-rate competitor who can't deliver the goods will only drive himself out of business.

Meeting Competition

I don't favor any other means of competition. Let him kill himself off. He will do it soon enough. It is going to cost us something in the meantime and it is going to cost the trade in general some business. But if we tell our aims to the customer, make him believe we are reliable and this organization stands for something, we can actually force the fly-by-night out of business. And to my way of thinking, that is our best means of doing it.

Now I am a little bit of a nut on the cost of a piece of material and what we should get for it. And here is a fairly simple rule I have worked out for service jobs under $50.00.

I figure the cost of my material and multiply that by three and I arrive at a pretty fair rough estimate. You may think that is pretty tough, that we should ask the customer to pay three times what the material actually cost us.

I had a little experience of that kind in the manufacturing business. I was privileged to see what some of these radio sets actually cost to build that are being sold in the market nowadays, and I found this company had to get actually 4⅓ times the manufacturing cost. The list price was 4⅓ times the actual cost, including overhead, or we couldn't make a dime on that radio. That sounds like a lot of money but I think you will find that is true in every line. The very minimum is three times the actual manufacturing cost, and in some cases it will go a lot higher than that.

But we are not afraid to make a profit. We are not robbing the customer. The best price you can get you will find is discouragingly small. We are entitled to a good wage. This is a specialized business. Every one of us will have to spend a lot of time and effort to learn this trade. Why should we be paid less than a tool maker who has no investment? He has taken time to learn his trade, of course. So have we. Are they any more craftsmen than we are? I don't think so. For that reason, I am a very strong booster of high wages.

Now this organization isn't primarily an employers' organization. And you may argue that from that standpoint therefore this organization shouldn't be interested in prices. But unless we get the prices, we can't pay the wages. I don't think there is a one of you here who wouldn't be glad to pay a service man who is able to make you money more wages. One of the best men I had I paid $60.00 a week and I would certainly liked to have kept him.

Estimating Installations

Now, as to estimating installation work, that is a little more what you might call an open proposition. We can go into a building and see what equipment we have to install and see what we have to work with and arrive at a pretty fair price. The only trouble we have with that is a variable time element. We can set a one-horse-power Kelvinator over here in the corner. We have it complete with starter. The machine has been in operation. We have the two temperature valves. We have the shutoff valves and the dry coils, but we have got to furnish knockout boxes, conduit, Greenfield connectors, the manifold valves and set the coils up in the box. Maybe we have a couple of walls to go through or a couple of difficult bends.

Now to look at that job, you would say, "A man ought to be able to do that in about

five hours." Well, you should be able to if you could just start in and set everything you could possibly use in a pile on the floor and reach down and pick this up and put it on and reach down and pick that up and put it on—that would be fine. But I have never seen a job yet you could do that on.

Time Allowance

If I find a job I figure I should be able to do in five hours, I think I am a whole lot safer if I figure eight hours. That is the way I do on every job. I figure what it should be and add 50%. And then in some cases I am a little pessimistic. In most cases I have figured under a little.

Now a good many argue that installation work should call for a little less price. I can't agree with that. I think a fair wage for a good service man should be somewhere in the neighborhood of $1.00 an hour. That is, under Detroit conditions. That is what I may eventually be able to pay. I figure $1.00 an hour for the man. Any plumber will tell you if you are paying your men $1.00 an hour you can't do business on $1.50. And if you are paying a man 75c an hour you can't do business on $1.50. But I have found a pretty safe rule is to add 50% on every job over two hours; and on every job under two hours, add 100% and you will be a whole lot closer to it.

In selling material, I find there is quite a common practice to put in whatever you can get by with. I ran into one case the other day in talking to a friend of mine in the supply business. He said there is one man who comes in there and he will take a 12 by 18 box and put six shutoff valves in it, six of the small type shutoff valves. The reason he has to have such a big box is because he never uses a three-way valve. They are too expensive. He will take a two-way valve and put in. That will work, but everyone knows the more joints you have the more chance you have of leaks. And for the same reason he never uses packless valves, he always uses packing valves. And you all know when the packing valve is opened and closed once or twice without taking up the packing you are going to have a leak. There is no question about that.

This same man whenever he tears out a job takes the old tubing coils up and throws them down into his basement. Maybe the old tubing has a lot of oil in it, but that makes no difference. The next job he gets he pulls out a piece that has no kinks in it, or he will cut the kinks out, and whenever he finds a run of about that length (4 feet) he will put that in. You know what kind of job that will be. It will be a damned poor job for anyone to have, I don't care whether he has methyl chloride or sulphur dioxide. The moisture in those lines won't do him a bit of good.

Now I don't think any of you will have any trouble, providing you go at it in the proper manner, in selling this man on the idea he should have packless valves. And it shouldn't be so hard to sell him new tubing. New tubing isn't so terribly expensive. You can certainly point out to him that, while he is putting the job in, he may as well pay $20 or $25 more and get a job that is going to work. Whereas, if he saves that now he will spend it on service calls and then won't have a good job when he gets through. Where is a man ahead if he has a Kelvinator machine and he saves himself $20.00 on the installation and there is a leak and it takes air into the machine, he gets a lot of corrosion, plugged screens, plugged receivers and things like that? He is not saving any money. It is costing him a lot of money.

Now try to put that idea over. I think that is the only way a man can really make money. You can cut prices until you are blue in the face and somebody else is going to be fool enough to get a little lower. And when you get through cutting, somebody else is going to be just enough fool to go a little lower in order to keep from loafing.

The only way we can correct this condition is to sell quality work and get the price for it. I don't care if a man bids 40c as against my 50c on a pound of sulphur dioxide, I will go in and do my best to tell him I have a better grade of sulphur dioxide, even though I may get it from the same plant. I am getting a fair price, and I know if I put the gas in it is put in right. And if he has any trouble and it wasn't put in right, is he going to stand behind it?

Truck Refrigeration

Construction Features to Consider When Designing a Practical Truck Installation. How to Figure the Heat Load. Calculating the Size of Cooling and Condensing Units

By JOHN ELLISON [1]

THE accompanying diagram shows a very efficient method of refrigerating a 450 gallon ice cream truck. Different types of insulations are used for the body, such as cork, Dry Zero blankets, hairfelt, Celotex, etc. It is customary to insulate the floor with cork boards. The thickness of the insulation may vary from two to six inches, depending on the temperature wanted. A 1½ hp. methyl chloride condensing unit mounted under the left front end of the body, furnishes the refrigeration. The compressor is of a horizontal double cylinder type, which is well suited to truck refrigeration on account of the low head room required for it. The unit is air cooled and automatically controlled by a combination low pressure switch and high pressure safety cut out switch.

The cooling units are of the Kold Hold type. These units consist of a tank about 54 inches long by 24 inches high by 1¾ inches wide. The tank is filled with about 100 pounds of a patented freezing solution in which the cooling coils are immersed. The latent heat value of this solution is 136 B.t.u. per pound and its [2] freezing point is —8° F. If sensible heat is removed until the temperature is reduced to the freezing point, and then 13600 B.t.u. (136 B.t.u. x 100) of latent heat is removed the liquid solution becomes a solid at —8° F. These 13600 B.t.u. of latent heat must be returned before the temperature of the cooling unit can rise above —8° F. This will explain why these units are able to hold the temperature for a long period of time. If the temperature inside the truck is —10° F. when truck leaves the plant, it is not expected to rise above zero after 10 to 12 hours' run. A thermometer is located in the front end of the body and visible from the driver's seat.

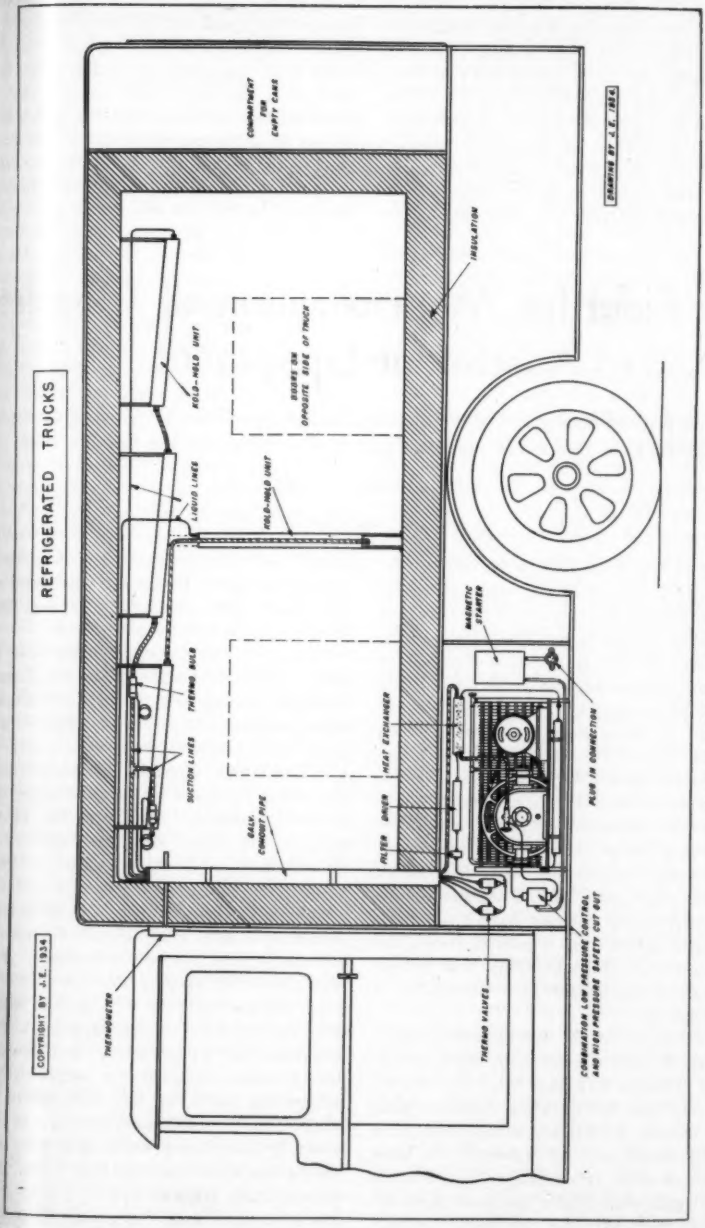
The installation in trucks for higher temperatures is practically the same except that the heat exchanger may be omitted. The purpose of the heat exchanger in low temperature installations is to prevent any possible freeze back to the compressor. It consists of a tube in which is placed a coil made of copper tubing to which the liquid line is connected. The suction gas will absorb heat from the liquid passing through the coil, thus a transfer of heat is attained.

In calculating the size of the cooling units and condensing unit the following items should be considered: Size of body, what kind of insulation and thickness, temperature outside and inside of body, number of times the doors are open and how long, number of hours the truck will be in service each day. If the temperature of the product loaded should be higher than the temperature wanted inside the truck, then the specific heat of the product must also be taken into consideration for all temperatures above 32° F. With the heat leakage known for each item the total daily B.t.u. load can be estimated.

With the proper valve assembly and connections (which has been developed lately) these cooling units may be charged from a stationary condensing unit located at the loading plant. This method will eliminate the dead weight load of the condensing unit from the truck, and it is probably the most efficient method when a fleet of trucks are operated from the same plant.

Meat trucks of the trailer type which are used on long runs have successfully been equipped with unit coolers. The condensing unit is located under the front end of the

[1] Copyright by John Ellison.
[2] The freezing point of the solution in high temperature units is 18 deg. F.



TYPICAL LAYOUT FOR REFRIGERATED TRUCK

body and the unit cooler is placed inside in the front end and hung from the roof. The meat is hung from rails placed crosswise in the truck; the doors are at the rear end.

Power to drive the condensing unit is taken from the engine of the truck. A generator which is driven from the fan pulley (double pulley) delivers current to the compressor motor. The voltage from the generator is automatically controlled so that the motor will run at a fairly constant speed, regardless of the speed of the truck engine. A double end motor is used so that when the truck is in the garage or at the plant, current from the power line may be used to drive the motor. The condensing unit is controlled by a thermostat which also controls the fan to the unit cooler. A thermo valve controls the flow of refrigerant (methyl chloride) to the unit cooler.

The Field for Modernization of Obsolete Apartment Equipment

With Reconditioning and Modernization the Subjects of the Day, Refrigerating Equipment in Apartment Houses Open a Vast Field for the Service Man.

By GEORGE H. CLARK

IN the period from 1932 to practically the present time, the management of apartment houses in the City of Detroit were a non-paying proposition. The city at this period was in very poor financial condition due to unemployment, and renting conditions suffered proportionately. Rent was greatly reduced. In many cases, apartments which formerly rented for as high as $150 per month were available at $50 per month. Apartments formerly renting from $60 to $100 could be obtained at $25 per month. In addition, a large number of apartment houses were approximately only 50% filled. In some cases some of the smaller apartments were closed entirely during this peak depression period. As a natural result, the maintenance of these buildings was not of the standard that obtains under normal renting conditions.

With respect to the refrigeration equipment, there were a good many good refrigerating systems; but there were also a good many very poor refrigerating systems which, under normal conditions, would have been properly maintained or replaced. In some cases there were unit refrigerators as much as ten years old. These machines were inclined to be noisy and required a considerable outlay in maintenance costs for replacement parts. Expansion valves and controls had to be replaced in a very large number on these old machines.

In some cases the apartments were formerly supplied with ice in ice boxes from a doorway opening into the hall of the apartment building. As electric refrigeration became more common, coils were put in the ice chambers of these ice boxes and tubing run down the walls to the condensing units in the basements. As a rule, the installations of this type were very sloppily put in and it is not to be wondered at that a considerable amount of system troubles developed. The machines used in these installations in a good many instances were comparatively small air cooled machines. There was also a tendency at this period to overload the machines so that in hot weather they did not have enough capacity to properly take care of the work. In other cases, refrigerators designed for mechanical refrigeration were in use and these were hooked up in multiple systems. In some cases the condensing units used were water cooled machines from one-half to one horsepower, which did, and still do, a pretty good job of refrigeration. In a good many cases,

however, the condensing units were air cooled machines and loaded too heavily for hot weather conditions.

Condensing Units

The condensing units in use on these systems are largely made up of air cooled Norge machines, Kelvinator Super Seniors, and Absopure one-quarter horsepower air cooled machines. The air cooled Norge machines which may properly take care of five to six apartments on one ½ horsepower condensing unit were usually connected to seven and sometimes eight apartments. In cool weather the refrigeration was all right; but in hot weather, the troubles start. In hot weather, the seals begin to give out and in some cases they merely open up temporarily to relieve a high discharge pressure. Incidentally, the time of day apparently has little to do with the tendency of the seals to blow out; and during hot weather we have had a large number of night emergency calls on these systems. The service man arriving on the scene usually has no difficulty in locating his building; as in most cases all he had to do was to pick the building with the doors and windows open and with tenants' heads outside the windows, or else the tenants themselves out in front. Getting to the machine was a little bit more difficult, especially if his gas mask happened to be some place else. Water cooled Norge machines under the same weather conditions gave comparatively a very small amount of trouble. In addition to seal trouble the Norge compressors often failed to pump as they should and the apartments got insufficient refrigeration. Experience has shown that adding oil to these rotary compressors improves their capacity as a compressor. After a large amount of oil has been added to these compressors on a number of trips in an effort to improve their capacity, oil bound evaporator trouble begins. On the whole, these systems can be very troublesome in hot weather.

We have also found a large number of quarter to one-third horsepower Kelvinator Super Seniors installed and connected to from five to seven apartments. In cool weather with the machine running a large proportion of the time, the apartments may get sufficient refrigeration; but in hot weather, the capacity of the condensing unit is diminished due to the increased discharge pressure; and the refrigeration demanded by the refrigerator is increased and in this case the machines are not able to give proper refrigeration. In hot weather the demand for ice cubes increases greatly and systems having condensing units of low capacity suffer thereby, as the amount of ice demanded works the machine to its full extent without allowing the evaporator to cool down sufficiently to properly preserve foods in the refrigerator. We have had several cases on exceptionally hot days where we have been informed that all the evaporators on one machine were defrosting. It has been found that this has been due simply to the fact that there is not enough machine capacity to supply the needs and the refrigerant is working at a temperature above 32°. In some instances in extremely hot weather we have not been able to take care of the service call on the day it was received. In such cases we have often arrived at the apartments to find the machine operating perfectly and all the coils frosted and ice cubes frozen. The fact that the temperature has dropped during the night accounted for this change in condition.

Absopure Systems

The Absopure air cooled systems largely consist of the quarter horsepower machines with the same size compressor used on a domestic self-contained machine. These compressors have a very small crank case and a very small oil capacity in the compressor. As in operating with a multiple float valve system there is a tendency for the oil to leave the compressor crank case and trap in the float chamber, this lack of oil in the compressor causes a good deal of compressor trouble. We have had eccentrics worn down to less than one-half the normal size due to the compressor running without oil. These quarter horsepower machines should properly be hooked to not more than two refrigerators; but for apartment house use we have found that they are generally hooked to three or four refrigerators and in some cases as many as six. Under these conditions it is only nat-

ural that they cannot properly refrigerate the complete system during hot weather when there is a constant high demand for ice cubes.

In the case of buildings which have been closed down during the cold period, an appreciable number of the water cooled machines have burst their water coils due to the freezing of the water in the coils. We have noticed this especially in the half horsepower Frigidaire machines and in the Nizer machines.

There is an improvement at the present time in the financial situation of the management companies operating apartment houses. The apartments are practically all filled, and many buildings which were closed entirely are open and paying dividends. As a result the management companies have an income on which to work and by giving their tenants better and more reliable equipment, they are not only able to keep their tenants satisfied but are able, by degrees, to increase the rent. Modernization of their obsolete equipment is thus uppermost in their minds at the present time.

Modernization by Degrees

Modernization of apartment refrigeration equipment may be undertaken in any one of several degrees. In a case of obsolete self-contained machines, these are being pretty generally replaced with self-contained machines of modern design. One of our customers replaced forty-two Kelvinators which were all over ten years old with an equal number of General Electrics. The fact that this particular apartment was combined with store properties of which one store was used as a salesroom for General Electric refrigerators, may have had something to do with this selection.

The greatest objection that can be offered to this type of modernization is one of finances. The first cost of such a change over is high and in addition the operating cost of individual machines is high. In a case of this kind the operating cost per machine would probably range from $1.00 to $1.50 per apartment per month. A multiple system could be installed for approximately the same cost, with a water cooled condensing unit, with which the cost of operation per apartment might be as low as 35c per month.

A second degree of modernization may consist in replacing cabinets and evaporators where these are in very poor condition and the condensing units may be replaced if they are obsolete and inefficient. It may be advisable in cases of this kind to run new tubing throughout the building, which at this date would have to be run in according to the local refrigeration code. Replacing the cabinets and evaporators and condensing units and putting in a new code installation will probably require a first cost equivalent to replacing refrigerators with new self-contained refrigerators. The advantage in this type of installation is that the operating cost would probably amount to not more than one-third the operating cost of the self-contained refrigerator.

Decreased Operation

A lesser degree of modernization may be obtained at a very reasonable cost for the savings and benefits obtained simply by replacing two or more obsolete air cooled machines with one larger water cooled machine. Among the advantages to be derived from such a change is the decreased operating cost. Another saving is in the decreased maintenance cost which is the result of several items. The water cooled machines will operate at lower liquid pressures. At the lower pressures, float valves which leak slightly and which may cause frost backs due to excessively high pressures in hot weather with air cooled machines will not allow sufficient refrigerant to leak through at the lower pressures to cause serious trouble. In addition there will be less carbonization of the oil due to the lower temperatures which obtain in the super heated refrigerant leaving the compressor. Therefore there will be fewer plugged lines and screens to cause trouble. The capacity of the condensing unit is not diminished to any extent on a hot day as the temperature of the cooling water has no appreciable variation. A water cooled system thus is enabled to take care of the refrigeration needs under extreme conditions.

An example of the benefits to be gained by this latter method of apartment house refrigeration modernization is well illustrated by an actual job which we undertook. In this particular case we had a forty-two apartment building which was equipped with Absopure refrigeration. There were twelve quarter horsepower condensing units. We serviced the refrigeration equipment on a complete maintenance contract. No week went by without some service being required and two or three calls a week were the rule. Our complete maintenance contract covers both labor and materials and we were obliged to use a considerable amount of methyl chloride and to overhaul the compressors and float valves frequently. In order to maintain this system, we were obliged to charge approximately 50 cents per month per apartment for maintenance. In addition to the maintenance cost, the inconvenience to the tenants due to frequent interruption in service is a large factor.

Comparative Figures

We modernized this equipment to the extent of supplying two 1½ horsepower water cooled machines to replace the twelve quarter horsepower machines. The connections from the risers to the machines were installed according to the local refrigeration code and due to the peculiar shape of this building, approximately 400 feet of conduit and 800 feet of tubing was required as well as 28 riser service valves. After this change over was made we had a very good chance to check up on the economy of operation of the revamped system by comparing power bills. The refrigerating system load and the elevator power came into the building in a three phase line. The average of two months' bills after the change over was made, compared to the two months' bills before the change over was made, showed a reduction in operating cost of approximately 35c per apartment per month. This was actually a 50% reduction in power consumption. In addition, due to the change over of equipment, we were able to cut our complete maintenance contract price 25c per month per apartment. This total saving of 60c per month per apartment will pay for the complete change over in less than two years.

Under the new conditions the machines cannot be heard above the basement, while the old machines were distinctly heard as high as the third floor. There have been practically no interruptions in the service since the change over has been installed. The number of service calls has been cut to approximately one per month and for the last several months the service calls have been chiefly concerned with replacing cabinet hardware. Service under our maintenance contract includes a monthly inspection of the machines and we expect that this system will remain in good condition for a considerable length of time.

S S S

BRUSH SEATER

The Ideal Brush Seater is a convenient tool for seating carbon, graphite or metal composition brushes. According to the manufacturer it saves more than 75% of the time and tedious drudgery of breaking in brushes with sand paper. Each brush is seated under actual operating conditions, without shutting down the machine, consequently, a perfect and accurate seat is given. Commutating efficiency is increased because of complete brush face contact. Sparking, due to poor brush contact, is instantly stopped, through a few moments application of the brush seater.

The brush seater is a soft, slightly abrasive insulating material of fine texture. It does not scratch or cut the commutator. The combination of the material removed from the brush and the brush seater gives the commutator or ring a high polish, which aids commutation. Simple to use—just hold the brush seater at the heel of the brush and press down on the brush. The friction from the revolving commutator, or ring, releases the brush seater material, which is carried under the brush. Standard size—4¾" long x 1⅛" x ⅝" face. The Ideal Brush Seater is manufactured by the Ideal Commutator Dresser Co., Sycamore, Ill.

S S S

Joseph F. Stanton has moved his refrigeration service business in San Francisco, Cal., from 2824 Franklin street to 2331 Green street.

Accounting Systems* . . .

By
J. B. COOK, C.P.A.
Consulting Accountant
R. S. E. S.

Proper Systems Are the Foundation of Every Business. Efficient Systems Are Capable of Being Run with a Minimum of Work. Survey Being Conducted to Determine Best Systems.

BRIEFLY, this is what I want to do for you: The Standard Accounting System is to be first, a time saver. It is made for the man whose time is valuable. The man whose rule is this: I will spend my time to get the greatest value out of it. The greatest net profits require the best and quickest methods in your office as well as in your shop. That is the rule on which this Standard Accounting System is built.

People must have your services. You are in an enviable position in this respect. Business in necessities is better than in luxuries these times. This is an advantage to your business. Of course, service inspection can be procrastinated, but generally your work, like that of a life-saver, must be done pronto.

In thinking over just what position you occupy in our civilization, I have compared you in my own mind with people of many occupations. You are engineers of health. You and the physician perform similar, valuable services to the community. You are as necessary as a police officer. He looks to prevent human crime and you try to prevent inhuman crime. You perform a service more vital than the plumber. He looks out for sanitation—you look out for the lives of people. You are liable to calls without warning, from anywhere known or unknown, while most other artisans and mechanics can keep regular hours. Your industry is a new one because mechanical refrigeration is new, and as year by year the so called saturation point of refrigerator sales approaches, and as the limit of depreciation is reached every year by a regularly increasing number—your essential value to the community is also just as surely increasing.

Only yesterday it was a luxury, today it is a necessity. You do not see so many advertisements of flats for rent this year "with mechanical refrigeration," because in these days they are presumed to have it. In my own apartment, I have had for many years a mechanical refrigerator of a make whose owners used to advertise "No one ever spent a cent for repairs on our refrigerators," and yet it happens at this moment my refrigerator is not in good condition. We tried two months ago to get service from the makers of this refrigerator and after much cajoling, they sent over a high school athlete or a bond salesman or a crooner or someone who must have had a "pull" to get his job, for he certainly knew nothing and did nothing about our unfortunate refrigerator. He promised to take it up with the office and that is the last we have heard of him. Yet, ours is one of the best known refrigerators on the market.

The government, as you know, at this time is making a great drive for rebuilding, repairing and reconditioning, and it is significant to my mind, the popularity of the effort to maintain first class things in first class condition. No one of you feels, either as an individual or as a professional man, that it is good policy to let a good machine get in bad repair and now that the first machines put out are becoming old and the total number in use is so great that repairs and renewals are already very numerous, you are the early members of a profession that is vital to humanity.

I need not tell you that if you do not do good work, your competitor will come along and take away your business. It is just as true that if you do good work, and I assume that you do, and that you appreciate the value of this new and rapidly growing Society of Refrigeration Service Engineers, you are going to improve your own organiza-

* Paper Presented at Refrigeration Service Engineers Society Convention.

tion and facilities to the greatest possible extent.

Now, just what part of your hours, in your effort, your payroll, your organization activities, are you going to give to the keeping of proper records? It would be a poor guess, I believe, to say that the average man of you is willing to devote more time than he absolutely must to the keeping of his accounting records. Which is but another way of saying that you want to keep the most efficient records possible, but efficiency means doing things as quickly as you can possibly do them correctly.

My office has prepared two articles on this subject that have been published in your magazine in July and August. A number of your firms in this city were visited by us in order that we might really become acquainted with your problems. By that, I do not mean simply the generalities of keeping a record of this and that and the other, but your own particular individual problems how to earn as much money as you properly can and how to collect it and how to keep your expenses down as far as you can without loss to yourselves.

Old Idea of Business

The old idea of business in the 90's was that records were useless. Then the wiser ones, who forged ahead, found that nuisance or not, they were absolutely necessary, so they accepted accounting in principle, and set about looking for the very best possible records that would provide quickest and easiest all the important information with the least possible time and expense. And these people who now keep good and efficient records, gentlemen, are the ones who will keep on increasing their business.

Our own organization has rendered valuable service to many trade organizations in the past, and we find uniformly that the fellows that succeed in business are the men who take care to have sufficient records to give them the maximum results or to put it in a more scientific formula, your greatest success requires that you shall have those records that give you the greatest possible net profit from their use.

In a convention like this, you are not interested in the exact minute details and description of just what those records should be, nevertheless, I shall endeavor to give you a bird's-eye view of what those records should look like and what they should do for you.

In two articles appearing in the monthly magazine of the Refrigeration Service Engineers, mention has been made of the record of your customers' accounts and of the record of your costs of each engagement, such a record being described as a "work order."

Transportation Time

It has been estimated by one of your members that 30% of the time of your repairman is spent in transportation to and from your customer's place and another 18% is spent in "non-chargeable repeat calls." To this must be added also a certain portion of available (sometimes called "idle") time and after deducting this and other time burden, i. e., non-chargeable time, you find that the actual time spent by yourself or your repairman at the customer's location is really a small percentage of the time spent productively on the job, and the time for which you or your man are compensated. It is the overlooking of this great quantity of non-chargeable time and the great quantity of uncharged supply and repair parts that spells the difference between success or failure in one's business.

Obviously, you could argue that the amount charged the customer for any actual visit may be fixed large enough to include all of these extras. This is correct in principle only up to a very limited extent. Your client simply will not stand for a fee of many dollars based upon the few minutes' actual service that he knows about. You must have some minimum charge, of course, for an inquiry and minor adjustment, however small but more than this, you must know with reasonable accuracy just what this service really cost you. This service that actually required one-half hour of time directly applied, may have been in fact one-half day's time, including traveling time, inspection time, return call time, etc., etc. Yet you, who do not go around with a silk hat and a finely tooled leather case of bottles as a family physician, cannot charge $5.00 for a

two-minute consultation. Your customer, who may or may not know anything about mechanics, does perhaps know a good deal about "chiseling," This is a very common and prevalent art today, and your customer, be he the most reasonable man in the world, yet if he is not abnormal, will want to know that there is a real basis and a record of what you charge him.

Now, unless you are going to do a lot of guess work, which we all know will not succeed in the long run, you are going to require records of your time and that of your men, showing where all your time went to. I do not need to tell you of the possibilities of a slick workman receiving a telephone call in your business, doing it on his own time and collecting for it as his own service, or any other of the cute tricks that from time immemorial are invited by laxity in keeping adequate records. Materials seem to have a way of disappearing, accidentally and otherwise if there is no control or record to govern them. One of your members discussed with our accountant the individual repairments record and the net amount of profit earned by him for the business. Most of you will not keep such a record, for one reason because of your other records are not complete enough to make that possible; for another reason, that you cannot see where it will bring you any additional money, and yet I can assure this progressive engineer that his idea should in the long run be a very profitable one and should help to maintain a very satisfactory clientele, as well as satisfactory repairmen. It should assist in detecting undercharging and overcharging or failure to charge.

Plan for Action

"What is to be your platform"—your plan for action that will make (or may break) your organization (or any other)? May I quote a portion of the printed report of the Resolutions Committee of the Association of Refrigerated Warehouses.

"We recommend that particular attention be given the following (first and foremost):

1. Uniform accounting and cost finding system for the industry.

Then, follow the other issues—all subordinate to accounting, namely:

2. Diligent watching of legislation, national, state and local.
3. Cooperation with and fostering of the work of Regional Groups.
4. Cooperation with the perishable food industries."

Credit Exchange

To this, I might possibly add also one more comparatively important activity, namely, a "Credit Exchange" for your commercial business. Please note, however, first in importance in their program just read to you, they placed uniform accounting. I would slightly rephrase this term, calling it for you "the Standard Accounting for Refrigeration Service Engineers."

Someone may object that you members have both large business and small businesses and therefore cannot have the same records. Some of you will keep your own records yourselves; some of you will employ a part-time bookkeeper; some will have large and complete sets of books. Also, some of you will add to the service business the installation of new units and may even buy and sell both new and used equipment. In all this, I call your attention to the fact that the service rendered by all of you principally is alike in kind. It is the maintenance of mechanical refrigeration service. Some of you will get into air conditioning service, some of you will broaden, others may not broaden their service, but the fact remains that refrigeration equipment service engineering is the principal business of all of you alike. I summarize my remarks, attempting only to outline the main features, and stressing only principal results it should bring to you, each one and altogether:

1st. The Standard Accounting System, when finished, will be one especially and exclusively designed for your own business and for no other. Our time and expense involved in our preparation of this system will have been greater when it is completed, than probably any one member of your society would want to spend alone for the accounting system.

2nd. It must and will be flexible, not rigid. It will be adapted to your own particular business, not simply to the average business or ordinary business, but to your own individual business and to its special

peculiar requirements, if your business has them as it probably has.

Efficient System

3rd. It will be a very efficient system, capable of being run with the least possible work necessary to give you proper adequate information. The keynote of our effort in preparing it for you (under the auspices of your accounting committee) will be to "make records that pay." That, after all, is what records are for. That is why you want to keep them and economically speaking, in the long run, that is why you must keep them and keep them well. These records ought to be capable of telling you the condition of your business promptly, your financial position today as near as possible and this with the least possible effort on your part or that of your assistant. Of course, this does not mean that your records will or can actually run themselves automatically— no sensible person expects that—but it does mean that you will have the most satisfactory and reliable results from the least possible efforts in keeping them. That will be extremely valuable to you. With the Secretary's permission—or at least, without his refusal, I am going to say that I hope the value to you of the accounting committee assisted by our efforts, will be worth to you much more than all the dues which you pay for membership in this Society. This system should give you, if properly run, the most satisfactory and reliable results from the least possible effort expended in keeping them. It would be extremely valuable to you—who may or may not like keeping office records. Also this cost to each of you will be reduced as low as possible. The certain forms and methods peculiar to this particular industry will be available not at the maximum, but at the minimum cost to you. The net result of these records at lower cost, I firmly believe, will be an important aid to your net income in the long run.

4th. You should hereafter be able among yourselves to "talk the same language." You will have a common background for considering your financial problems, your cost problems, certain important competition problems. Intelligence in these vital matters instead of lack of knowledge, and maybe mutual suspicion, will help your future policy,—a common viewpoint among you rather than the many different points of view. Obviously, it cannot be expected to eliminate intelligent competition. I don't think you really want to eliminate competition. Competition is in one aspect advertising and really a stimulus to trade, but you should see that it is the right kind of competition, intelligent and helpful rather than destructive and wasteful and ignorant. This kind of business is legal—while direct price-fixing is not legal. The same net result can be obtained legally, in fact, with the approval of the law—and no one of us will insist that an illegal is better than a legal method.

5th. Cost—In individual refrigerator repair cases, usually the minimum charges have been used to cover the average cost of a simple repair job. Incidentally, I am not convinced that they do cover these costs on the average and (I hope future cost study may determine whether they do or not) when your Standard Accounting and Cost Committee finds the right opportunity to anaylze these costs in oft repeated cases, I think the facts may be astonishing to many of you, and reveal the need of revision of the minimum charge or at least a more limited application of that charge basis.

Minimum Charges

But this household machine repair service is small compared with commercial machine service and most firms do not use a minimum charge at all except in inspection cases only, i. e., where no actual repair work has been done other than possibly minor adjustments. And the ever increasing volume of maintenance service which is contracted for by the month of year, is as dependent on cost knowledge of time, material and burden as any other business can be.

In this connection there comes to my mind a now prosperous industry whose association members got to studying their costs and analyzing them with such enthusiasm that for the time these cost committee conferences were the most interesting activities of the association and were attended by many onlookers and listeners-in, who were not members of the committee. Its studies broad-

ened astonishingly into the larger scope of general business methods—even so far as to analyze operating efficiency and the result was that net profits of many of the companies were greatly increased.

6th. The branching out in your business activities, whether you lean toward the left or the right politically and whether you support the government recovery plans or oppose them, in fact, whether you wish or not (and I am sure you do wish) this is the greatest machine age of all time. For you service engineers it offers an enormously growing industry and profession, opening up new kinds of responsibility and service. Your opportunities as individuals and as members of a wide-awake progressive association will open new vistas of progress, air conditioning and other mechanical devices yet to come, designed for general use, should make you absolutely indispensable servants of the community, duly rewarded because of your large and vital field of action.

7th. Summarizing—Your Refrigeration Service Engineers Society represents, I am sure, a great growing industry of vital importance to the community. You are beginning to make history right now and we all want to build the very best we can, both now and for the future. The greatest, or at least one of the greatest benefits to you will be this well developed, clear cut, standard accounting system, which, we believe, you will recognize and sponsor through your standard accounting cost committee, and also by your own suggestions directly addressed to me as follows: Mr. J. B. Cook, c/o The Secretary of Your Society, 435 North Waller Avenue, Chicago, Illinois.

Books Required

Our survey is now well on, but we need your own personal views. You have some valuable ideas that will help this major activity of your society this year. Some of you ask, "What will it look like? Is it ideas or just a lot of ledger accounts or computations? Just what will it be like when it is finished?" I would give you this description of what it will look like:

For the medium sized business, there will be the following books: Ledger, Journal and Cash Book, and Order Book. Those are the principal books. There will be about five special printed forms including: 1. Work Order. 2. Sales and Job Cost Sheet. 3. Expense Distribution. 4. Order Summary and Control. 5. Financial Statement Form. In addition, a simple manual of instructions will be furnished you. We shall not require any special printed ledger sheets or general journal sheets or payroll records, etc. Your own record of this sort that you now have will probably be usable for this purpose, although, if requested, we can recommend the best ready made forms of this kind.

The key to the system's value to you will, of course, be the special forms designed entirely for you. These will fit the size of your business and its special requirements will be provided for by either condensed or extended distribution forms.

* * *

PARTS DISTRIBUTOR TAKES LARGER QUARTERS

ENCOURAGED by its increased business volume during the past season, Utilities Engineering Sales Company, wholesale distributors of tools, parts, supplies and accessories for electric refrigeration, announces its removal to larger and more convenient quarters at 410 North Wells Street, Chicago, Illinois.

The new location, according to E. P. Sorensen, president of the firm, provides increased facilities for display, storage and service to customers. Ample parking space for cars and trucks of customers is available at the rear loading platform.

The company does no servicing. When service calls come in, recommendations are made of competent local service firms.

A new enlarged catalog has recently been released, describing Mueller Brass Valves and Fittings, Imperial, Henry and Kerotest tools, Turner torches, Wolverine copper tubing, U. S. Gauges, Dayton Belts, Penn Controls, Aminco Expansion Valves. Other lines carried are gaskets, motor brushes, porcelain repair kits, compressors, compressor seals, refrigerants, water valves, etc. A copy of this catalog may be obtained by any service man writing to the above address.

C. E. Hamilton is purchasing agent, while counter sales are supervised by R. E. Pryor.

THE Question BOX

Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box" which will be answered by competent authorities.

THE following questions submitted to the Question Box of the Refrigeration Service Engineers' Society, are answered by Mr. Clarence E. Hamilton, chairman of the Educational Committee of Chicago Chapter.

Question 55. I am having some trouble with a Majestic Model 51. This machine runs fine for awhile and then every once in awhile when it starts up it seems to jar the whole machine for a moment or two and then runs quiet the rest of the cycle.

I found this machine leaning forward about 1½ inches; that is, I raised the front legs that much to level it. But still it does this awful pounding once in awhile when it starts up; it seems to shake the trays inside the freezing unit.

What would you suggest?

ANSWER. Question indicates that liquid refrigerant (SO_2) is slugging back from the cooling unit as such slugging will cause a knock which can usually be corrected by lowering the front of the cooling unit slightly. This lowers the effective liquid level. Knocking may be stopped by closing the suction valve and then opening slowly after knocking stops. If knocking again starts, repeat operation. Leakage of the refrigerant flow control may be the direct cause of the liquid slugging.

Question 56. What can cause a compressor on a Frigidaire Model T5 to act sluggish, after having replaced switch, expansion valve, and put in new gas?

ANSWER. Rather an indefinite question. If you mean that the compressor does not come up to speed, belt may be slipping. If referring to the performance and pumping of the compressor, there may be leakage through the discharge or suction valves or improper seating.

Question 57. Please advise me if it is advisable to change a Servel high side float and pressure control system to an automatic expansion valve and temperature control system. Explain how.

ANSWER. Change may be made if desired. Satisfactory results have been obtained from such a change over. System should be pumped down, float removed, expansion valve installed near or attached to cooling unit. Electrical terminals of thermostat are to be attached to the motor the same as were those of the pressure control. The thermostat bulb may be clamped to the cooling unit or inserted in the tank if a brine tank is used.

Question 58. I am having difficulty with the compressor on a Welsbach refrigerator. Using oil of 150 viscosity put out by the Matheson Company, the pistons seize within a short period after machine is charged with Ethyl Chloride.

I have thoroughly washed out this machine twice with No. 1 formula alcohol and dehydrated it.

While this machine is running to remove the air from the system, the compressor remains free. Within ten minutes after charging, the compressor gives audible sound of seizing. Before an hour, it is completely seized. The rings are stuck in the grooves with a black carbon-like substance. The oil is also full of this same substance, being almost black.

Will you please tell me what to do to overcome this difficulty?

ANSWER. Eskimo Ice Machine Oil sold by the Gulf Refining Company is recommended for use in the Welsbach machine. The writer has never used the oil sold by Matheson Company in an ethyl chloride machine. However, would suggest that the system again be thoroughly cleaned and recharged with Eskimo Oil. See September 1934 issue of the REFRIGERATION SERVICE ENGINEER for further information on the Welsbach unit.

DETERMINING THE RATE OF SERVICE CHARGES

By HARRY D. BUSBY

THE method consists of utilizing a few known facts and evolving them into what can be termed a mathematical problem. This, of course, produces a theoretical cost but is useful in determining a fair rate of service charge.

Transportation costs, of course, will vary with the different makes of cars used, but, on the basis of driving a Ford, which is most commonly used, I believe the following will be found to be a fair estimate—

The original cost of a Ford is about	$600
It should run a total of 60,000 miles, and, if used for service only, will average about 15,000 miles per year.	
Since the car will last 4 years on this basis, the average depreciation per year will be	$150
Insurance—Approximately	50
Licenses	18
The average operating cost will run 2c per mile, or 15,000 x .02 which equals	300
The total transportation cost per year	$518

On the basis of an 8-hour day, there are a little over 2400 working hours per year. Therefore, the transportation cost per hour equals

$$\frac{\$518}{2400} = .22 \text{ per hour}$$

In making a study of service work for a company by whom I was employed, it was found that over an average of 1000 calls one call required 2 hours on the premises. Of these 30% required 15 minutes or less on the premises, 50% one-half hour or less, 75% one hour or less, and the balance required one hour or more. It was also found that at least 18% repeat calls or "call-backs" could be expected, and that 30% of the man's time was spent in traveling, etc.

If we say a man's time is worth 75c per hour, and, since 30% of his time is spent traveling, the 75c per hour you pay him represents only 70% of what it costs you for an hour's work on the premises.

Therefore, you are actually paying him $\frac{100}{70} \times .75 = 1.07$ per hour for his productive time

Likewise, since on 18% of his calls you will receive a repeat call for which you will collect nothing, $1.07 represents only 82% of your cost and it will be necessary to charge $\frac{100}{82} \times 1.07 = \$1.30$ per hour for that man's time

Overhead will vary from 20% to 25%. Considering it as 25%, your hourly cost will be

$$\frac{100}{75} \times 1.30 = \$1.73$$

and $1.73 + .22 (cost of transportation) = $1.95 per hour—Total Cost

In order to work with round figures, we will say your cost is $2.00 per hour, and, since the average call requires 2 hours, it means we will have to get an average of $4.00 per call.

To the average customer $2.00 an hour straight rate is an exorbitant charge, and, to the person who is going to give you several hours' work on one job, it is not a fair rate in comparison to the person who is going to give you one hour's work or less. In order that the charge should be fair in both cases and at the same time net you the average of $2.00 per hour, it is necessary to set up a sliding rate of charge.

I previously mentioned that 50% of the calls required one-half hour or less on the premises. Since it requires just as much traveling time and transportation cost to make this call as it does one requiring several hours on the premises, it seems only fair that they should bear the largest part of this $4.00 average cost per call. Therefore, if we make our minimum charge on the basis of one-half hour or less, the charge should be

½ of $4.00 which is $2.00

The hourly rate per hour thereafter would be the balance of the $4.00, or

$2.00 ÷ 1½ hours

which will be a rate less than $1.50 per hour.

$2.00 1st ½ hr. or less
$1.00 2nd ½ hr. or $3.00 for 1st hr.
$1.00 per hr. thereafter.

CHART NO. 17

COMPRESSOR, MOTOR AND COIL CAPACITY TABLE

For Retail Store Coolers—3″ Insulation—Average Temperature Range 35° to 45°.

LBS. ICE EQUIVALENT IN 24 HRS.	BTU 24 HRS.	CU. FT. COOLED SPACE	SQ. FT. FIN COIL	MOTOR HORSE POWER
		REACH IN COOLER		
160	23040	75	75	1/4
219	31536	100	100	1/3
307	44208	130	130	1/2
353	50832	190	190	1/2
		WALK IN COOLER		
588	84672	420	295	3/4
676	97344	640	320	3/4
840	120960	700	350	1
966	139104	800	400	1
1176	169344	900	450	1 1/2
1352	194688	1000	500	1 1/2
1954	281376	1500	750	2

For counters allow 30 lbs. IME 24 hours and 10 sq. ft. fin per foot length of counter. The above data is only approximate and should be used with discretion and conservative engineering judgment. Allow 1/3 to 1/2 horse power for every 10 foot length of counter.

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Cut out along outer line and insert in binder for ready reference.

FOR LEATHER BINDER WRITE TO H. T. McDERMOTT, SECRETARY REFRIGERATION SERVICE ENGINEERS' SOCIETY
433 N. WALLER AVE., CHICAGO, ILL.

The REFRIGERATION SERVICE ENGINEER

A Monthly Illustrated Journal, Devoted to the Interests of the Engineer Servicing Refrigeration Units, Oil Burners and other Household Equipment.

Vol. 2 November, 1934 No. 11

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Official Organ
REFRIGERATION SERVICE ENGINEERS' SOCIETY

MAINTAINING RECORDS

ONE of the glaring examples of inefficient operation, which has been noticeable, is the laxity of keeping proper records. Informative records are an essential part of every refrigeration service shop, and provision should be made for the keeping of such records in the shop where they are easily accessible. The history of every service call should be available at all times, and such records can be easily kept without involving too much time.

The greatest fault it seems, is putting off the entering of such records, or the fact that the forms used are not easily kept. As a consequence, oftentimes the posting of such records are postponed until they have become lost. Particularly with regular customers, a proper record of each installation will facilitate the handling of future calls. In the coming issues of THE REFRIGERATION SERVICE ENGINEER, some simple records will be discussed and published.

Oftentimes, the service man can save himself some needless call-backs if more definite information is secured when the phone call is received at the service office. No doubt, most service organizations have experienced such a call as "Our Frigidaire is not working," and upon further questioning, it will be found that the Frigidaire turns out to be a Kelvinator, Majestic or Grunow Frigidaire. This is just a case where a trade-name has been accepted quite generally as indicating mechanical refrigeration.

So that in answering telephone calls, in addition to securing as much information as possible as to what may be the trouble, it is necessary that some effort be made to secure as much advance information as may be practical.

For instance, if a report should come from a previous call that the belt has broken, and if this information has been listed on the card record in the office, it would be a simple thing in making a service call to be sure that the right belt is in the service truck, and that another call would not be necessary. It is records of this character that are going to place the service organization on a business-like basis, and render a more satisfactory service to the consumer.

* * *

SERVICING IS SERVICE

SPEAKING recently with the service manager of a firm that is handling its refrigeration installations nationally through independents, he went on record as to the effective service that he has obtained through this method of installation in 90% of his contacts.

"What of the other 10%?" was the natural query. "Well, that 10% is what is worrying us at the present time. This, however, is no reflection upon their ability to do the proper work, and I might definitely state here that our experience with independents throughout the country as far as refrigeration knowledge is concerned, has been more than satisfactory." However, this 10% is condemned because of their laxity in recognizing that promptness should be one of the cardinal virtues in this servicing business. He further states that there was no question that the growth of independent servicing was a foregone conclusion, but that the independent service organization must organize itself in such a manner that prompt service will be guaranteed to the national manufacturer and distributor.

The independent service organization should recognize that they are in reality the

go-between manufacturer and customer. Any reflection on the servicing or installation of the refrigerating equipment is a reflection on our business integrity, and we can't afford to engage any servicing organization that will not give the service that we would render if we had a direct factory branch located in that particular town.

I feel confident that the independent service concern will be able to attract more of this business from the manufacturer just as soon as he can convince them that he is in a position to give the service demanded. These 10% of service companies that I have referred to, apparently have not fully realized that refrigeration servicing is synonymous with promptness. Oftentimes, a telegraphic request to them does not hasten their activities. The very fact that it is a telegraphic request should indicate the urgency of the call. However, they take it in due time, and as a consequence, we jeopardize our position with our customer. Naturally, we can't afford to have any such conditions prevail.

I cannot impress too strongly again, that my firm opinion is that independent servicing is a most economical method for many national distributors such as our company, but the situation would be most ideal if we could have all our servicing done as satisfactorily as it now is in 90% of our cases. I want to say this for the benefit of the independents who are anticipating the day when they will be in a position to command some of this business, which is surely coming.

S S S

ROTARY SEAL

THE Rotary Seal Company, 809 W. Madison St., Chicago, Illinois, is issuing a new circular, descriptive of the replacement seal for domestic refrigerators of the better-known makes.

The seal is simple in construction and is widely used by service men in replacing defective seals and stopping loss of refrigerant, seal squeaks, and the possibility of moisture and air seeping into the system.

The new circular in addition to a description of the seal assembly, lists the refrigerators on which the Rotary Seal can be used as standard replacement.

Drastic Price Reduction

Effective November 1, the Rotary Seal Company has announced that a liberal discount will be extended to service men and the service man should communicate direct with his jobber and distributor. If they do not handle the Rotary Seal the manufacturer invites correspondence direct at the above address.

S S S

SERVEL SERVICE

THE Dessent Electric Company, Chicago, who also operates the Copeland Refrigeration Company, on October 11, 1934, took over the servicing of the Servel Refrigeration Company's commercial and household equipment in Chicago and Cook County.

This firm carries a complete stock of Copeland and Servel parts.

S S S

STEWART-WARNER DENIES RUMOR

STEWART-WARNER Corporation is actively preparing for 1935 production, it was stated by Joseph E. Otis, Jr., president. A group of the corporation's principal distributors has been in conference at the factory recently planning the sales campaign for the radio season now starting and discussing next year's refrigerator program.

This statement was made by Mr. Otis in answer to rumors that the corporation contemplated withdrawal from the field. Announcement of the 1935 line will be announced later.

S S S

FEDDERS' APPOINTMENTS

MR. MARC SHANTZ, Manager of the Chicago branch of the Fedders Mfg. Co. announces the appointment of R. H. Spangler as sales representative for the St. Louis territory. Mr. Spangler is carrying a complete stock of Fedders refrigeration appliances and offers immediate delivery to service engineers in the St. Louis area.

Announcement is also made of the appointment of M. D. Ratcliff as sales representative for the Wisconsin territory.

REFRIGERATION SERVICE ENGINEERS' SOCIETY

Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.

THE OBJECTS OF THE SOCIETY

To further the education and elevation of its members in the art and science of refrigeration engineering; with special reference to servicing and installation of domestic and small commercial equipment; for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery.

ASSOCIATION HEADQUARTERS: 433-435 North Waller Ave., CHICAGO, ILL.

CHANGE IN INITIATION FEE AND DUES FOR 1935

THE Constitution and By-Laws of the National Society in reference to initiation fee and dues provide for initiation fee of $5.00 and yearly dues of $7.50. By previous action of the Board of Directors the dues and initiation fee combined were fixed at $5.00 for each year of 1933 and 1934.

At a meeting of the Board of Directors held on October 11, 1934, by unanimous action it was determined that effective January 1, 1935, all new applications must be accompanied by initiation fee of $2.50 and yearly dues of $5.00. This will be in effect on all memberships accepted on and after January 1, 1935. Dues to all present members as heretofore will remain at $5.00 per year.

At the Board of Directors' meeting held on October 13, 1934, in accordance with the Constitution and By-Laws the Board of Directors, after consideration of the invitations for the holding of the 2nd Annual Convention, voted unanimously in favor of the holding of this Convention in Detroit, Mich., the exact dates to be announced later.

S S S

SECOND LECTURE RELEASED

THE second release of the Lecture Course being prepared under the supervision of the National Educational and Examining Board has been mailed to all members of the Society.

This Educational bulletin entitled "Refrigerants—Part One" treats of the characteristics and properties of the more commonly used refrigerants including sulphur dioxide, methyl chloride, and Freon. Tables treat of the "Properties of Various Refrigerants" and also the "Temperature-Pressure Relations of Saturated Vapors of Common Refrigerants."

In the section devoted to the "Behavior of Refrigerants" the text is illustrated with simple diagrams which graphically show their behavior under different conditions. A chart shows how the specific gravity varies for the various liquid refrigerants at variable temperatures.

S S S

MILWAUKEE CHAPTER

Meeting of October 16

MILWAUKEE CHAPTER held its regular meeting on Tuesday evening, October 16, and convention reports were given by Mr. J. J. Geering and Mr. Ellsworth Anderson, both of whom reported on the activities of the first day of the convention. Mr. Henry Miller and Mr. Lee LaDue reported on the happenings of the second day and Mr. Frank McLaughlin gave a résumé of the proceedings which occurred on the third day. President G. D. Wang elaborated on the reports of the other members.

Unusual interest was shown by Milwaukee Chapter from the reports as they were given, and it was hoped that those who were not able to attend this first convention

could plan for attendance at the second convention in 1935 to secure considerable knowledge on the latest developments occurring in the field.

Chicago Chapter to Meet with Milwaukee Chapter

An invitation has been extended to Chicago Chapter to meet with Milwaukee Chapter in joint meeting at their hall in Milwaukee at their meeting on November 20. It is hoped that a large delegation from Chicago will attend this meeting. Chicago members desiring to make arrangements to attend the Milwaukee Chapter meeting should communicate with President T. J. Fowler.

S S S

R. S. E. S. MEMBERS VISIT IMPERIAL PLANT

IMPERIAL Brass Mf'g Company of Chicago held "open house" to members of the Refrigeration Service Engineers' Society who attended the convention held in Chicago last month. Cars were sent to their meeting place at 2111 W. Jackson Blvd. and four groups each with a competent guide, were escorted personally on a tour of inspection through their plant at 1200 W. Harrison St.

They were first shown the foundry on the top floor, which is equipped with both gas and furnaces. On the next floor the various machining and stamping processes were explained, also where shut-off cocks are assembled, and valves are ground to perfect seat.

On the floor below they saw a brass rod enter at one end of "automatics" and come out the other end as completely machined nuts and connectors. They saw the new "Sylpack" valve assembled and tested. This is the new packless type and listed as standard by Underwriters' Laboratories, Inc., and in actual official test the sylphons were able to withstand more than 100,000 cycles of oscillation without rupture. They also saw strainers, dehydrators, Hi-Side Floats, solder fittings machined, assembled and tested. They saw Imperial's tube working tools assembled—the flaring tool, tube cutter, refacing tools, all of which have proved so popular and indispensable to the service man.

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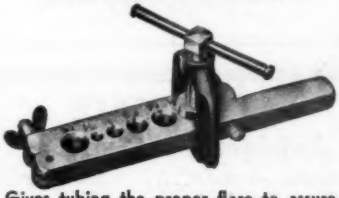

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Set of 6 for 1/4", 5/16", 3/8", 7/16", 1/2" and 5/8" Tubing.
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Automatic Exp. Valves	$3.50 & 4.50

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Turn your losses on repaired controls into profits and end your free service calls on controls by installing NEW Penn Controls, specially designed to fit Copelands and nearly all other household units. Price $3.95.

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CARL JOHN STEIN COMPANY
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On the bottom floor giant machines stamped out brass forgings. At the finish of the trip each member was presented with a Century of Progress plated cane also manufactured by this company which turns out perhaps a greater variety of products than any other concern in the country. An interesting place was the paint spray booth, where Imperial tests its paint spray guns. Also welding equipment and automotive equipment items are turned out here. This tour was in line with the educational policy of the society and Imperial inform us they hope that members who were not able to take this tour at this time will be able to afford themselves of the opportunity at some future time. Imperial feels it is a real benefit to them to come into close contact with the men who are on the "firing" line and help work out their problems with them.

S S S

O. Morrison
California

Enclosed is remittance for subscription to the "Service Engineer." Your journal is very helpful in solving the problems that arise in the field.

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WANTED—Experienced man to sell commercial fin coils. Refrigeration engineer preferred. $50.00 per week plus commission and selling expenses. Address Box 102, THE REFRIGERATION SERVICE ENGINEER, 433 N. Waller Ave., Chicago, Ill.

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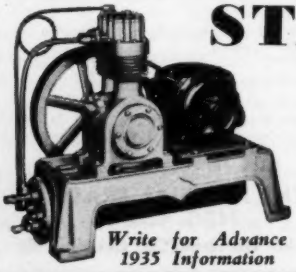

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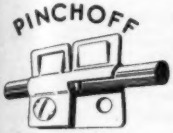

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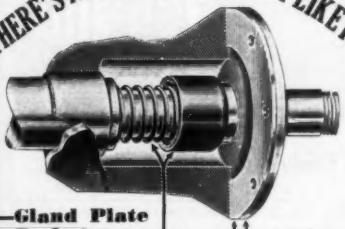

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B—Gasket
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"Patented"

Prevents Loss of Refrigerant

Eliminates Seal Squeaks

Stops Unnecessary Friction

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2: It is known for its long life for the reason that it has no delicate parts to crack or break. It is also very economical in operation as there is no packing to replace or any periodical inspection to make.

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—It's for Your Convenience

THIS department is conducted for the convenience of our subscribers. We will ask the manufacturers and distributors to send you the latest information on the items checked.

- ☐ Belts
- Blowers (see Unit Blowers)
- ☐ Books
- ☐ Brushes, Motor
- ☐ Bushings, Motor
- ☐ Carbon Tetrachloride
- ☐ Charging Hose
- ☐ Charging Stand
- Coils
  - ☐ Fin
  - ☐ Pipe
- ☐ Compressors
- Condensers
  - ☐ Air Cooled
  - ☐ Water Cooled
- ☐ Condenser Water Regulators
- ☐ Connecting Rods
- Controls
  - ☐ Cold
  - ☐ Humidity
  - ☐ Liquid Level
  - ☐ Pressure
  - ☐ Temperature
  - ☐ Thermostatic
  - ☐ Water
- Dehydrants
  - ☐ Activated Alumina
  - ☐ Calcium Chloride
- ☐ Dehydrators
- Door Seals (see Gaskets)
- ☐ Drums, Service
- ☐ Dryers
- Evaporators
  - ☐ Dry
  - ☐ Flooded
- Filters (see Strainers)
- ☐ Float, High Side
- ☐ Float Valve Seats
- Fittings
  - ☐ Flared
  - ☐ Streamline
- Gaskets
  - ☐ Compressor
  - ☐ Door
- ☐ Gasket Material
- ☐ Gasket Tackers
- ☐ Goggles
- ☐ Gauges, Service
- ☐ Hardware, Refrigerator
- ☐ Leak Detectors
- ☐ Liquid Indicator
- ☐ Lubricating Oils
- ☐ Needles, Float Valve
- ☐ Oil Return
- Packing
  - ☐ Fabric
  - ☐ Metallic
- ☐ Piston Pins
- ☐ Piston Rings
- ☐ Porcelain Refrigerator Cement
- ☐ Pumps, Circulating
- ☐ Receivers
- Recording Instruments
  - ☐ Humidity
  - ☐ Running Time
  - ☐ Temperature
- Refrigerants
  - ☐ Sulphur Dioxide
  - ☐ Methyl Chloride
  - ☐ Carrene
  - ☐ Freon
  - ☐ Iso Butane
  - ☐ Ethyl Chloride
- Refrigerator Dishes
  - ☐ Glass
  - ☐ Porcelain
- ☐ Safety Masks
- ☐ Seals, Shaft
- Strainers
  - ☐ Expansion and Float Valve
  - ☐ Liquid Line
  - ☐ Suction Line
- Switches
  - ☐ Air Temperature
  - ☐ High Pressure Control
  - ☐ Low Pressure Control
  - ☐ Pressure
  - ☐ Temperature
- Thermometers
  - ☐ Refrigerator
  - ☐ Test
- ☐ Tool Chests
- Tools
  - ☐ Flaring
  - ☐ Pinchoff
  - ☐ Tube Bender
  - ☐ Tube Cutter
  - ☐ Wrench Sets
- ☐ Trap, Scale
- ☐ Trays, Ice Cube
- Tubing
  - ☐ Copper
  - ☐ Finned
  - ☐ Steel
  - ☐ Tinned
- ☐ Unit Blowers
- Valves
  - ☐ Automatic Expansion
  - ☐ By Pass
  - ☐ Check
  - ☐ Compressor
  - ☐ Expansion
  - ☐ Flapper
  - ☐ Magnetic
  - ☐ Pressure Reducing
  - ☐ Shutoff
  - ☐ Solenoid
  - ☐ Thermostatic Expansion
  - ☐ Two-Temperature
  - ☐ Water
- ☐ Valve Retainers
- ☐ Valve Stems

Write in Names of Products Not Listed

_____

_____

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Name .....

Address .....

City and State .....

Business .....

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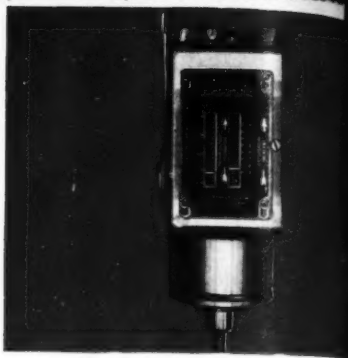

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